COMPARATIVE ANALYSIS OF FUNCTIONAL OUTCOME IN PATIENTS WHO UNDERGO TOTAL KNEE ARTHROPLASTY WITH OR WITHOUT PATELLAR RESURFACING

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DECLARATION BY THE CANDIDATE

I hereby declare that the thesis entitled "**COMPARATIVE ANALYSIS OF FUNCTIONAL OUTCOME IN PATIENTS WHO UNDERGO TOTAL KNEE ARTHROPLASTY WITH OR WITHOUT PATELLAR RESURFACING**" submitted towards partial fulfillment of the requirements for the award of **MS in Orthopaedics** degree to BFUHS is a compilation of original work carried out by me under the supervision of **Dr. Rajnish Garg**, Professor & Head, Department of Orthopaedics and **Dr. Pankaj Mahindra,** Associate Professor, Department of Orthopaedics. No part of this thesis has formed the basis for the award of any degree previously.

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Dedicated

to

my Family,

friends

&

Teachers

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Dr. MANVINDER SINGH

LIST OF ABBREVIATIONS

ACL	Anterior cruciate ligament
BEP	Bone end plates
CRP	C reactive protein
COX-2	Cyclooxygenase 2
CR	Cruciate retaining
DVT	Deep vein thrombosis
DMARDS	Disease modifying antirheumatic drug
ESR	Erythrocyte sedimentation rate
LBA	Low backache
NSAIDS	Non steroidal anti-inflammatory drugs
OA	Osteoarthritis
PRE-OP	Pre operatively
POST-OP	Post operatively
PCL	Posterior cruciate ligament
ROM	Range of motion
TKJR	Total knee joint replacement
TKA	Total knee arthroplasty
TKR	Total knee replacement
VAS	Visual analogue scale
WOMAC	The western ontario and mc master universities osteoarthritis index

ABSTRACT

Background: TKA is one option to relieve pain and to restore function to an arthritic knee. The most common reason for knee replacement is that other treatments such as: weight loss, exercise/physical therapy, medicines, and injections have failed to relieve arthritis-associated knee pain. The decision to resurface the patella during TKA remains controversial. We have performed this clinical trial study to examine the efficacy and short term outcomes of TKA with and without patellar resurfacing.

Aims and Objective: To compare -the functional outcome in patients who underwent TKR with patellar resurfacing or without patellar resurfacing. To compare frequency and severity of anterior knee pain and other complications in both groups (TKA with or without PR).

Material and method: the study was conducted on 68 patients in department of orthopedics at DMC Ludhiana. The study was divided into two groups. Patients who underwent resurfacing(n=14) and who did not underwent resurfacing of patella(n=54) Pre-op and Post-op pro forma (at minimum six months of follow up), and WOMAC score was recorded to assess various factors which affect patient satisfaction.

Results: Significant difference was observed on comparing the WOMAC score preoperative and 4 weeks after surgery with WOMAC score after 4 weeks being significantly less then preoperative WOMAC score. At 24 weeks follow up the WOMAC score in patients with patellar resurfacing was significantly less (1.29±2.16) than the other group (3.35±3.19). However, at 6 months post op follow up the score did not show any significant difference.

Conclusion: This study further indicated the long-term survivorship was not significantly different between the 2 groups both for revision surgery and patellar-related complications. Regarding the studies, more knee surgeons have concluded that it is not necessary on a regular basis to resurface the patella during primary TKA.

Keywords: TKR, WOMAC, VAS, Anterior knee pain.

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INTRODUCTION

The knee is the largest and most complex synovial joint. The patellofemoral and tibiofemoral are the two articulations of the knee joint functionally. Transmission of body weight from the femur to the tibia is provided by tibiofemoral joint while providing hinge-like, sagittal plane joint rotation along with a small degree of tibial axial rotation. The patellofemoral articulation also known as the extensor mechanism helps in extension of the knee[1].

Knee pain is extremely prevalent. Every year, more than one in every five people suffers from knee discomfort, with one-third of these people seeking medical help[2]. These complaints comprise a large spectrum of ailments including sports injuries, trauma, infectious diseases, and degenerative diseases. Osteoarthritis (OA) of the knee is one of the most prevalent causes of knee discomfort, especially in older people. The existence of healthy hyaline cartilage on the articulating surfaces of the femur, tibia, and patella is largely responsible for pain-free and adequate knee mobility. Knee Osteoarthritis is a joint condition in which degeneration and loss of articular cartilage occurs, leading to pain, impairment in performing daily activities, and worsening of quality and quantity of gait[3].

Non-surgical management is the mainstay of treatment for patients who initially present with patello-femoral osteoarthritis. A stepped care approach consisting of painkillers (usually non-steroidal anti-inflammatory drugs (NSAIDs), shoe inlays, muscle strength exercises and intra-articular injections with corticosteroids can give (temporary) relief and allow patients to function satisfactorily for a longer period of time. Additionally, specialized programs in which orthopaedic surgeons work together with physical therapists both before and after TKA surgery can improve muscle strength postoperatively[4]. When nonoperative treatment fails, surgical options can be considered. In relatively young patients with a significant varus or valgus alignment of the knee, it is possible to perform proximal tibial osteotomies or distal femoral osteotomies respectively to normalize the alignment. This can unload

the medial compartment (in varus OA), or the lateral compartment (in valgus OA), which reduces symptoms and postpones an (partial) arthroplasty. Uni-compartmental knee OA can be treated by replacing the affected compartment with a medial, lateral, or patellofemoral uni-compartmental knee prosthesis. However, worldwide the most performed and most extensively researched surgical treatment of knee OA is the TKA.[5]. Which treatment is most suited for a specific patient is often debatable, and it is important to inform patients about the benefits and risks of each specific type of treatment. This allows patients to decide together with their treating physician if surgery and which type of surgery would be the best option.

TKA has extensively been used to treat end-stage OA of the knee for the last half century. During TKA surgery, the destructed bone and cartilage surface is removed and replaced with a metal femoral and tibial component with a polyethylene (PE) insert in between. If necessary, the articular surface of the patella can also be replaced with an inlay or onlay patella component. With TKA, most patients experience significant pain reduction and regain knee function[6].

The most effective treatment of the patello-femoral joint during total knee arthroplasty (TKA) remains controversial, and according to different national arthroplasty registries there is a remarkable variation between countries in whether the patella is resurfaced or not[7]. In Norway and Sweden, only 2% of the TKAs have their patellas resurfaced (Norwegian Arthroplasty Registry 2014, Swedish Knee Arthroplasty Registry 2014). In Denmark, 76% of the patellas are resurfaced (Danish Knee Arthroplasty Registry 2014) and in Australia 54% are resurfaced (Australian National Joint Registry 2013). In the USA, 98% of TKAs registered in the Kaiser Permanente Registry were performed with patellar resurfacing (Paxton et al. 2011). Advocates of patellar resurfacing emphasize cost-effectiveness, a reduced number of reoperations, and less anterior knee pain (Helmy et al. 2008, Clements et al. 2010, Murray et al. 2014). Proponents of patellar retention claim that patellar resurfacing offers no advantages in functional outcome, reoperation rate, or total healthcare cost (Burnett et al. 2009, Group et al.

2009, Breeman et al. 2011), and that it is associated with more complications (Ogon et al. 2002. But no consensus on the best management has been reached[8].

A large part of TKA research focuses on trying to improve the methods of measuring (functional) outcome. The rationale behind this is that with increased understanding of how patients function after TKA, it is possible to find new approaches for increasing satisfaction levels and patients' function after TKA. Research into functional outcome measures concentrates both on subjective measurements like patient reported outcome measures (PROMs), as well as on objective measurements in the form of in-depth gait analyses, which are widely used in human movement sciences but are relatively novel in TKA research. Patient reported outcome measures PROMs is the general term used for a variety of self-reported questionnaires which allow researchers to quantify a wide selection of outcome variables like pain, satisfaction, and function. They are designed to be easy-to-use, practical tools to allow physicians and researchers to quickly obtain data from patients. They are almost ubiquitous in TKA research and are even mandatory tools to evaluate quality of care in Dutch hospitals[9].

Western Ontario and McMaster Osteoarthritis Index (WOMAC) is a disease-specific questionnaire extensively used in patients with knee and hip arthritis. It was initially designed to evaluate clinically important, patient-relevant changes in health status and therapeutic benefits following intervention. WOMAC has been translated into more than 65 different languages worldwide. It was originally meant to be a self-administered tool, but it has been validated for usage via telephone interviews, multimedia with audio-visual presentations, verbally spoken computer programs, and mobile phone applications. Minimal guide is required to complete the questionnaire and interpret the score. Studies have shown that it has greater or at least comparable responsiveness to changes compared to other scoring tools, with excellent reliability, construct, content and criteria validity[10].

Whether resurface the patella or not in total knee arthroplasty (TKA) is still controversial. Due to different school of thoughts and results of studies done, it is necessary to properly review the literature, with a view to establish the strongest evidence available in support of the procedure. The present study was conducted with the aim of comparing the functional outcome in patients who underwent TKR with patellar resurfacing or without patellar resurfacing and also frequency and severity of anterior knee pain and other complications in both groups were compared using WOMAC score at 0,4.24 weeks respectively.

AIMS AND OBJECTIVE

- To compare -the functional outcome in patients who underwent TKR with patellar resurfacing or without patellar resurfacing.
- To compare frequency and severity of anterior knee pain and other complications in both groups (TKA with or without PR)

REVIEW OF LITERATURE

The knee's anatomy creates an angle called the Q-angle (quadriceps-angle), which is along the line of pull of the quadriceps. It is measured clinically as the line from the anterior superior iliac spine to the centre of the patella and second line from centre of patella to the tibial tubercle.[11] This angle is physiologically valgus across the knee and this valgus force vector must be countered by the soft tissues restraining the patella and the lateral facet of the femoral trochlea.

The patella articulates with the cartilage in the patellar groove on the distal femur between 10 and 100 degrees of flexion with the groove following an arc of 90 degrees. The trochlea averages 31-34 millimetres (mm) in height, however there is considerable variation in trochlea height, width and shape within the population. The trochlear groove is between 35-38 mm wide.[12] The patella is a shifting fulcrum of the lever of the extensor mechanism as the knee constantly flexes and extends.[13] The amount of contact the patella has with the femur varies depending on the position of the knee. The patella contact area is small and distal in early flexion, and increases in area and progresses proximally throughout increasing flexion[14], maximum patella-femoral contact area occurs at 120 degrees of flexion.[15]

The contact pressure between the patella and femur is high with the maximum pressure occurring at 90 degrees in knees with a normal Q-angle.[15] This pressure can increase significantly where the Q-angle is increased, as in a valgus knee joint.

The patellar articulate cartilage is the thickest hyaline cartilage in the body, as is befitting of the huge forces transmitted through it. The thickest point is 7mm deep and the facets of the patella are unique in shape and position to each individual knee[16]. Patellar cartilage is more permeable and more compressive than cartilage elsewhere, which may, along with large contact pressures, explain why patella cartilage lesions are more prevalent than other cartilaginous lesions[17].

Possible indicators for selective patellar resurfacing:

Little consensus exists regarding indication for patellar resurfacing. Current possible indicators include pre-operative anterior knee pain, patient obesity, high grade chondromalacia and patellar malalignment.

Bourne et al.[18] performed a study of American National Joint Replacement Registry data and formulated a clinical algorithm to help surgeons decide whether or not to resurface the patella during TKA.

1. Resurfacing would be recommended if there is significant patella-femoral disease on history and examination.
2. If on pre-operative assessment there appears to be mainly tibia-femoral disease, than an intra-operative patellar cartilage assessment should be made and if assessed as poor then resurfacing performed.
3. If the patellar cartilage appears preserved then congruency and tracking are assessed with poor congruency and congruency requiring resurfacing.
4. If the patellar tracks well and has a good congruency, then the arthritis aetiology is an important factor with patellar resurfacing considered for the inflammatory causes.
5. Lastly, if the patient had non-inflammatory arthritis aetiology and is >60 years old, then resurfacing should still be considered.

Therefore, according to Bourne's algorithm, patellar resurfacing can be avoided in patients that are <60 years old with knee osteoarthritis, but without patella-femoral disease on history or examination and intra-operative assessment shows preserved patellar cartilage on a well-articulating and centrally tracking patella.

D. G. Campbell et al.[19] in 2006 did a randomised control trial, prospective double blinded study on "Patellar resurfacing in total knee replacement" using American Knee Society Score, WOMAC Score and radiographic evaluation and concluded that they were unable to recommend routine patellar resurfacing in osteoarthritic patients undergoing total knee arthroplasty.

Deehan D et al in 2008[20] examined the anterior knee function in two patient groups who had undergone primary knee arthroplasty without patellar resurfacing to identify differences for osteoarthrosis compared

with rheumatoid disease. They identified two consecutive series of patients who had undergone knee replacement surgery for either osteoarthritis or rheumatoid disease between 1992 and 1994 under the care of a single surgeon. There were 90 patients in each group. All were examined and asked to complete a questionnaire so as to determine Hospital for Special Surgery (HSS) score, Western Ontario and McMasters Universities Osteoarthritis Index (WOMAC) score, Bartlett patellar score and a Visual Analogue score (VAS) for any persistent anterior knee pain at rest. They failed to identify any significant differences in terms of anterior knee function between these two groups of patients. The re-operation rate was similar for both groups. It would appear that primary knee replacement for rheumatoid disease is met with a similarly good outcome for anterior knee function despite absence of patellar resurfacing.

John D. Swan et al.[21] 2010 in their study of "The need for patellar resurfacing in total knee arthroplasty: A literature review" concluded that there is no single superior patellar treatment option available to an orthopaedic surgeon performing a total knee arthroplasty and the potential risks and benefits need to be assessed and balanced on a surgeon's experience, preference and patients expectations. Based on evidence to date, it appears that patellar resurfacing is the better option over non resurfaced patella. As can be seen from the literature over the decades, surgeons are improving patellar resurfacing outcomes through superior implant designs and fixation, better surgical technique and more anatomical extensor mechanism alignment. Selective patellar resurfacing appears to be the ideal solution if the selection could be based on robust criteria with a sound evidence base.

Abdul khan et al.[22] 2012 in their study "Results of Total knee replacement with/without resurfacing of the patella" studied 688 patients, among which 449 had patellar resurfacing while 239 did not have resurfacing and 36 patients in the non resurfacing group had patelloplasty. In patients with pre-op patella-femoral pain, the incidence of post operative clunk was significantly higher ($p<0.005$) in the resurfacing group. In patients without pre-op patella-femoral pain, the

incidence of post-op crepitus was significantly higher ($p<0.005$) in resurfacing group.

Calvisi V et al in 2012[23] conducted a systematic literature search for evidences comparing treatment effect and harm of resurfacing versus non-resurfacing the patella in total knee arthroplasty and yielded five meta-analysis (MA), one systematic review (SR) and six randomized controlled trials not included in previous MAs/SR. The evidence suggests that patellar resurfacing would reduce the risk of anterior knee pain, as well as the risk of patella-related reoperation. Furthermore, patients not undergoing patella resurfacing would experience more knee pain during stair climbing and be less satisfied with surgery. No significant difference in range of motion can be expected with or without patellar resurfacing. Importantly, methodological limitations were observed in all retrieved studies and evidences about potential adverse events related to patellar resurfacing are presently undetermined.

Yim SJ et al in 2012[24] conducted a study with the purpose to evaluate the clinical effect of electrocautery on the reduction of pain in patellar non-resurfacing bilateral total knee arthroplasty.A total of 50 patients were enrolled into this study; all patients had undergone bilateral patellar non-resurfacing total knee arthoplasty at our hospital, between January 2007 to December 2008. The minimum follow-up period was 1 year. The electrocautery of the patellar rim was performed randomly on one side only. The clinical results were evaluated between the electrocautery group and the non-electrocautery group based on measures of anterior knee pain, range of motion, American Knee Society clinical rating score, Feller knee score, Western Ontario and McMaster Universities score (WOMAC), and radiographic analysis. There were statistically significant differences between preoperative and postoperative status for all parameters. There were no statistically significant differences noted between the electrocautery group and the non electrocautery group for all parameters.

Beaupre L et al in 2012[25] conducted a randomized controlled trial. The primary purpose was to compare knee-specific outcomes between patellar retention and resurfacing up to 10 years after primary total knee arthroplasty.38 subjects with non-inflammatory arthritis were randomized at primary TKA surgery to receive patellar resurfacing (n = 21; Resurfaced group) or to retain their native patella (n = 17; Non-resurfaced group). Evaluations were performed preoperatively, one, five and 10 years postoperatively by an evaluator. Self-reported knee-specific stiffness, pain and function, the primary outcomes, were measured by WOMAC. They found no differences in knee-specific results between groups at 5–10 years postoperatively. The Non-resurfaced group had two revisions due to anterior knee pain similar to rates reported in other studies.

Joo JH et al in 2013[26] conducted a study. The purpose of this study was to compare the outcomes of patellar resurfacing and non-resurfacing in two-stage revision of infected TKA. This study involved a retrospective comparison of the reinfection rate and clinical outcomes of revision TKA patients managed with patellar resurfacing (22 patients, 23 knees) and patients managed without patellar resurfacing (26 patients) at a minimum two-year follow-up. Three scales were used in the assessment: the Knee Society Score, Western Ontario and McMaster Universities Osteoarthritis Index, and the Anterior Knee Pain Scale. Three knees had recurrent infections. All infections occurred in patients who had received patellar resurfacing. There were no significant differences between groups in clinical results and on the Anterior Knee Pain Scale. A lack of patellar resurfacing did not increase recurrence of infection and did not result in significant clinical differences compared to patellar resurfacing.

IH Abdulkareem et al.[27] in 2014 did a study “patella resurfacing in total knee arthroplasty: A review of current literature” that it may be more sensible to selectively resurface the patella based on objective assessment of pre operative symptoms, radiographic images, intra articulate findings etc.

Donald W. Roberts et al.[28] 2015 did a research on patients of 2 surgeons at one centre enrolled in a prospective, blinded, randomised study of selective patellar resurfacing named “selective patellar resurfacing in total knee arthroplasty: A Prospective, Randomised, Double-Blind study” in which 350 knees in 270 patients were included in the study. Satisfaction was higher in patients with a resurfaced patella, But after long term follow-up of 10 years, there was no significant difference between 2 groups. No difference was found in KSS scores or survivorship. No complications of patellar resurfacing were identified. Overall concluded that patient satisfaction maybe slightly higher with patellar resurfacing.

Kim SH et al in 2015[29] conducted a research with the purpose to compare the midterm outcomes between patellar resurfacing (PR) and patellar preservation (PP) in high flexion TKA. A total of 373 knees of primary TKAs were performed using high flexion design, 339 knees involved PR group and 34 knees involved PP group. Radiographic outcomes, clinical outcomes, patients’ satisfaction, ability and pain related to the high flexion activities were also evaluated. There was no significant difference in radiograph measurements, KS function score and WOMAC score. However, PR group showed better outcomes in KS knee score and HSS score. There was no significant difference in postoperative satisfaction and ability of high flexion activities between the groups, but the pain at the high flexion activities in PP group was worse than that in PR group.

Eirik Aunan et al[8] 2016 stated in their study “Patellar resurfacing in total knee arthroplasty : Functional outcome differs with different outcome scores” A randomised, double-blind study of 129 knees in 115 patients (mean age 70(42-82) years; 67 females) with 3 years of follow up using KOOS as primary outcome measure showed that Patellar resurfacing maybe beneficial over non resurfacing in patients undergoing primary TKA. Whereas using secondary, classical outcome measures — including KSS, OKS, and patient satisfaction recorded on VAS — did not reveal any statistically significant difference between groups.

Brian A. Spencer et al.[30] 2016 in their retrospective study of patellar resurfacing versus circumferential denervation of the patella in total knee arthroplasty compared rates of anterior knee pain and functional outcomes between resurfaced patellas and non-resurfaced patellas with a circumferential denervation in a group of 169 TKA's (110 patients) with a minimum follow up of 2 years after total knee arthroplasty. There was no significant differences between the 2 groups regarding knee society scores, anterior knee pain scores, or visual analogue scale scores. Circumferential denervation and patellar resurfacing during total knee arthroplasty lead to similar incidences of anterior knee pain.

Sanjay Agarwala et al.[31] in 2018 did a prospective study "Patellar resurfacing versus nonresurfacing with patellaplasty in total knee arthroplasty" on 120 knees (60 patients), using scores that include — mean KSS, MSMCS, Fellar patellar scores with Mean follow up of 19 months that there is no statistically significant difference in short term clinical, functional and radiological outcomes in the two groups operated by two different surgeons (including the possibility of surgeon based bias), and therefore routine resurfacing of patella in patients undergoing primary TKA with posterior stabilised Hi flex fixed bearing for knee Osteoarthritis is not advantageous.

Kaseb MH and his team in 2018 [32] performed a study to compare the short-term clinical outcomes of TKA performed with and without the patella resurfacing. A total of 50 patients with osteoarthritis of the knee (OAK) were randomized to receive patellar resurfacing (n=24) or to retain their native patella (n=26). Disease specific outcomes including Knee Society Score (KSS), Knee Society Function Score (KSKS-F), Kujala Anterior Knee Pain Scale (AKPS), Western Ontario and McMaster Universities Arthritis Index (WOMAC), Short Form 36 (SF-36), and functional patella-related activities were measured within six months of follow-up. There was no significant difference between the resurfaced and non-resurfaced groups in pre and post-operative improvement of range of motion, KSS), KSKS-F, AKPS, WOMAC, and pain score. The results showed no significant difference between patellar resurfacing and non-resurfacing in TKA for all outcome measures in a short term.

Cho WJ et al in 2018 [33] conducted a study is to compare the clinical and radiographic outcomes of total knee arthroplasty (TKA) with patellar retention in accordance with the severity of patellofemoral arthritis. They retrospectively reviewed patients who underwent TKA with patellar retention between September 2010 and May 2015. The radiographic severity of patellofemoral arthritis was categorized according to the Iwano classification system. Clinical outcomes were evaluated using the Hospital for Special Surgery score, Knee Society Score, function score, Western Ontario and McMaster Universities Osteoarthritis Index(WOMAC), and Feller score. Four hundred seventy-four knees were enrolled and assigned to mild (n = 208) or moderate to severe (n = 266) groups. The preoperative Feller score was significantly lower in the moderate to severe group, whereas the postoperative clinical and radiographic results did not differ significantly between the 2 groups.

Chengzhi Ha et al.[34] 2019in their study of “Resurfacing versus not-resurfacing the patella in one-staged bilateral total knee arthroplasty: a prospective randomised clinical trial” analysing 120 knees stated that Anterior knee pain and clunk syndrome rates were lower on resurfaced side compared with the non-resurfaced side.

Lokesh Chawla et al.[35] 2019 in his study about Functional outcome of patellar resurfacing vs non resurfacing in Total Knee Arthroplasty in elderly : A prospective 5 years follow-up study compared a total of 100 subjects at department of orthopaedic surgery, Goa Medical College and Hospital and concluded that 82% of patients in patellar resurfacing group had shown excellent outcome as compared to 86% in non-resurfacing group. Additionally, VAS revealed no significant difference between groups.

Walker LC et al. in 2019[36] published a review discussing the available evidence surrounding the predictability of the outcome of TKA using the WOMAC score as well as considering further patient factors that have been implicated in the level of improvement post TKA. It was concluded from the available literature that a combination of knee scores and patient factors would be the most accurate way of predicting those

patients most likely to have a good outcome from their TKA. There is some disparity within the literature about which patient factors and reported outcome measure scores lead to a positive postoperative outcome. Patient expectations following the procedure also need to be evaluated, as objective measures on a scoring system do not necessarily equate with the subjective patient experience.

Feng B in et al. 2020[37] aimed to evaluate the clinical outcomes and surgery survivorship for over 10 years following patellar resurfacing or nonresurfacing in total knee arthroplasty (TKA) in a cohort of Chinese patients. From 1998 to 2003, 355 patients underwent primary TKA in our institute. The survivorship of TKA between the patellar resurfacing and nonresurfacing groups and the clinical outcome of Hospital for Special Surgery knee score, Western Ontario and McMaster Universities index score, patellar score, patellar related complications, and radiological results were studied at latest follow-up. There was no statistically significant difference for the Hospital for Special Surgery score, Western Ontario and McMaster Universities score, and the patellar score between the 2 groups after an average 12.4-year follow-up. Non-resurfacing group had higher anterior knee pain than the resurfacing group. The patients with rheumatoid arthritis had a 2.9-fold higher rate of patellar-related complications than did the patients with osteoarthritis. The 10-year survival rate was not significantly different between the 2 groups both for revision surgery and for patellar-related complication.

Liu J et al in 2021[38] conducted a study to determine which factors contribute to patient satisfaction and compared the various scoring systems before and after surgery. In this retrospective cohort study, 545 patients were enrolled and evaluated preoperatively and 1 year postoperatively. Patient demographics, as well as scores for the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), Short Form (SF)-12, and 1989 Knee Society Clinical Rating System (1989 KSS), were recorded preoperatively and postoperatively. There were 134 male patients and 411 female patients, with an overall prevalence of satisfaction of 83.7% 1 year after surgery. WOMAC score had a vital role postoperatively (change in WOMAC pain

score, $p < 0.001$; change in WOMAC physical function score, $p < 0.001$; postoperative WOMAC pain score, $p = 0.004$). They Concluded that **a** history of surgery, the preoperative 1989 KSS, and the preoperative SF-12 influenced patient satisfaction after primary TKA. They recommend the WOMAC (particularly the pain subscale score) to reflect overall patient satisfaction postoperatively.

Surgical Technique:

Anterior midline incision is the frequently used incision for primary TKR and medial parapatellar retinacular approach is the standard retinacular incision. Knee is flexed and anterior cruciate ligament, anterior horns of medial and lateral menisci along with any osteophytes are removed. At valgus angle distal femoral cut is made perpendicular to the predetermined mechanical axis of the femur. If the transepicondylar is used as a reference point for femoral rotation, then the posterior femoral cut is made parallel to a line drawn between the medial and lateral femoral epicondyles. Anteriorposterior axis is determined by drawing a line between the bottom of the sulcus of the femur and top of the intercondylar notch and posterior femoral cut is made parallel to this axis. When the medial condyles are referenced, cut is made in 3 degrees of external rotation off a line between them. Tibia is cut perpendicular to the axis with 0 to 5 degrees of posterior slope and approximately 6 to 8mm of proximal al tibia is removed as measured from the intact compartment. Flexion and extension gaps are balanced at a time by placing spacer blocks or a tensioner within the gaps with knee in flexion and extension. Varus valgus balance is fine-tuned with further medial or lateral releases. The entry portal for the femoral intramedullary alignment rod is placed a few millimeters medial to the midline, at a point anterior to the origin of the PCL. Tibial extramedullary alignment guide 3mm medial to the midline of the ankle in an effort to centre the guide over the middle of the talar dome.[39]

Correction of the varus deformity is done by sequentially releasing the semimembranous aponeurosis, superficial medial collateral ligament and pes anserinus insertions and also by checking for stability at each stage.

To correct Varus deformity releases the iliotibial band at the level of the joint line. For greater deformity strip the lateral collateral ligament off the lateral condyle along with the popliteus tendon.[40]

PREPARATION OF THE PATELLA [41,42]

Clearing the quadriceps tendon

Any residual synovial tissue on the quadriceps tendon just above the superior pole of the patella was removed to avoid the potential for postoperative soft tissue crepitus in a PCL-retaining technique or the clunk syndrome in a PCL-substituting design.

Measuring Patellar Thickness and Applying a Cutting Jig

Patellar thickness was measured before preparation. Female patellae usually are 22 to 24 mm thick and male patellae 24 to 26 mm. A patellar cutting jig was applied. It was set to allow a bone remnant that amounts to the precut patellar thickness minus the thickness of the prosthetic patellar button.

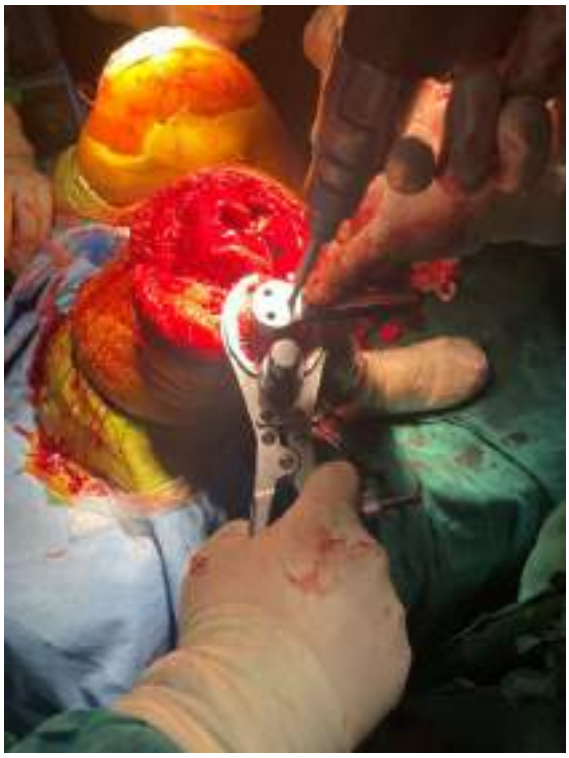
Cutting the Patella

The patella cuts were made from medial to lateral and from chondroosseous junction to junction. On the lateral side, all remaining cartilage was removed down to a sclerotic bone surface. The thickness of the patellar remnant was also measured off the resected medial side to confirm the previous measurement. Oversizing the patella in both the anteroposterior and mediolateral dimensions were avoided. If undersized, the patellar prosthesis was displaced medially to facilitate patellar tracking. The uncapped lateral bone was outlined and then chamfered to relieve possible bone impingement on the metal trochlea. The composite thickness was measured after preparation and overstuffing of the patellofemoral compartment was avoided. After the patella is properly sized, lug holes are drilled through the appropriate template.

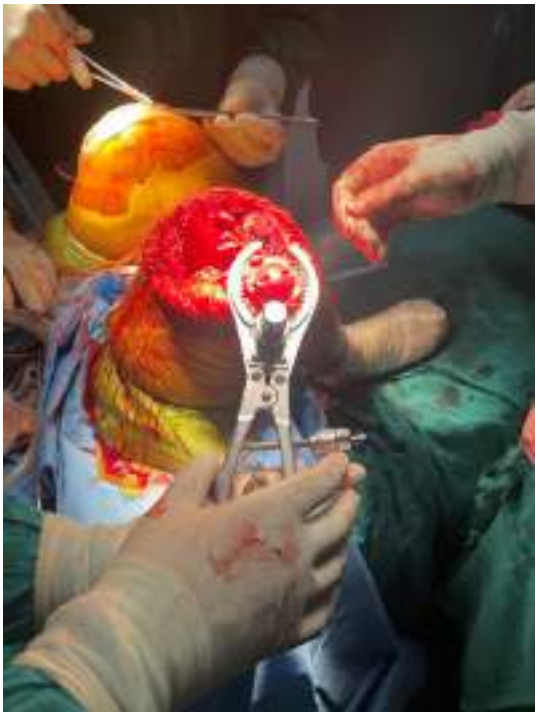
Picture 1: Intra op patellar cartilage condition

Picture 2:Sizing the patella

Picture 3: Applying the Jig



Picture 4: Lug holes are drilled through appropriate template



Picture 5: Trialing being done

Picture 6: After cementing

Cementing done after a thorough normal saline wash using pulse lavage and components were fixed at respective sites. Synoventomy done at supracondylar region. Closure was done in layers.

MATERIALS AND METHODS

This was a prospective study evaluating the various factors affecting satisfaction of patients undergoing total knee arthroplasty from 1st Sept 2019 to 7th July, 2021 (Including 6 month Follow-up) at the Department of Orthopaedics, Dayanand Medical College, Ludhiana. Patients will be assessed at a zero, one and six months follow-up period using a proforma having Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) Score.

After obtaining clearance and approval from the institutional ethical committee, patients have been enrolled on the basis of the inclusion / exclusion criteria after obtaining informed consent.

INCLUSION CRITERIA

Patients undergoing primary TKR for knee arthritis.

Patients willing to participate in the study.

EXCLUSION CRITERIA

1. Patients undergoing revision knee replacement.
2. Patients not willing to participate in the study

The study will be carried out by taking an informed consent from the patients willing to be a part of the study. Pre-op and Post-op proforma and WOMAC score will be recorded to assess various factors which affect patient satisfaction.

Sample size-

The study was conducted on a total of 68 patient after taking informed consent. 38 patients (55.9%) underwent bilateral knee replacement, 18 patients (26.5%) with left side total knee replacement and 12 patients (17.6%) with right sided total knee replacement.

Study type-

Prospective study for evaluation of functional outcome in patients undergoing TKA with or without patellar resurfacing.

Duration of study: The present study was conducted in the department of Orthopaedics, Dayanand Medical College and Hospital, Ludhiana over a period of 2 years from September 2019 to July 2021. A total number of 68 cases of osteoarthritis were analyzed pre and post -

operatively to evaluate functional outcome in total knee arthroplasty with or without patella resurfacing using WOMAC score at 0 weeks, 4 weeks and 24 weeks after operation. The study was carried out by taking an informed consent from the patients.

HISTORY

CLINICAL EXAMINATION

RADIOLOGICAL EXAMINATION

INVESTIGATIONS-NECESSARY FOR ANESTHETIC FITNESS

DIAGNOSIS- clinical and radiological

SURGERY-TOTAL KNEE REPLACEMENT

POSTOPERATIVE TREATMENT

ROUTINE ANTIBIOTICS AND ANALGESICS

EVALUATION BY X-RAYS

PHYSIOTHERAPY AND FUNCIONAL REHABILITATION

OUTCOME

Evaluation of functional outcome in total knee arthroplasty with or without patellar resurfacing at 0 weeks, 4 weeks and 24 weeks and point were assigned as per WOMAC score.

Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC):

Name: _____

Date:_____

The activities in each category to be rated according to the following scale of difficulty:

0 = None, 1 = Slight, 2 = Moderate, 3 = Very, 4 = Extremely

Stiffness

1. Morning stiffness
2. Stiffness later in the day

Pain

1. Walking on flat surface
2. Going up or down stairs
3. At night while in bed
4. At rest
5. Weight bearing

Physical Function

1. Descending stairs
2. Ascending stairs
3. Rising from sitting
4. Standing
5. Bending to floor/pick up an object
6. Walking on flat surface
7. Getting in/out of car
8. Going shopping
9. Putting on socks/stockings
10. Rising from bed
11. Taking off socks/stockings
12. Lying in bed (turning over, maintaining knee position)
13. Getting in/out of bath
14. Sitting
15. Getting on/off toilet
16. Heavy domestic duties
17. Light domestic duties

Total Score: _____ (out of 96)

(Higher Score on the WOMAC indicate worse pain, stiffness and functional limitation)

OBSERAVATIONS AND RESULTS

This was a prospective study evaluating the various factors affecting satisfaction of patients undergoing total knee arthroplasty from 1st Sept 2019 to 7th July, 2021 (Including 6 month Follow-up) at the Department of Orthopaedics, Dayanand Medical College, Ludhiana. A total number of 68 cases were analyzed pre-operatively and post-operatively for the functional outcome, which is done using WOMAC Score, in patients undergoing total knee arthroplasty with or without patellar resurfacing at 0, 4 and 24 weeks after surgery. After the surgery, participants showed significant improvement in WOMAC score as compared to pre-operative scores. The results obtained are given below:

Table 1: Age distribution of patients

AGE (YEARS)	No. of cases	Percentage
< 50	2	2.9%
51-60	25	36.8%
61-70	32	47.1%
> 70	9	13.2%
Total	68	100%
Mean age	62.72±7.53years	

Out of the total 68 patients majority were in the age group of 61-70 year (32 patients, 47.1%), followed by 51-60 years (25 patients, 36.8%). The least number of patients were noted in the age group of <50 years (2 patients, 2.9%). (Table 1). The age range of the patient was 44-79 years. The mean age being 62.72±7.53years

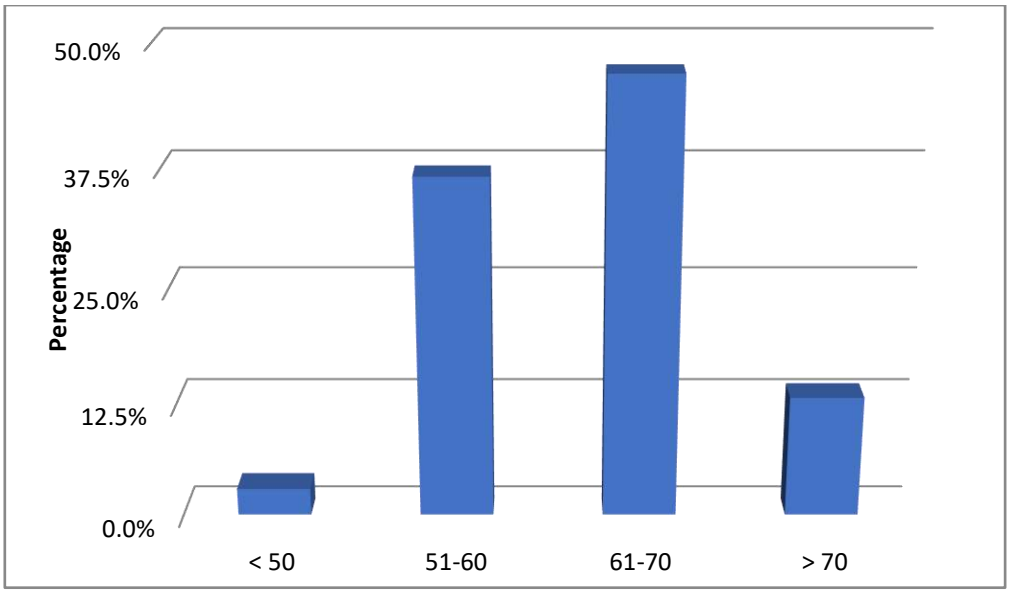


Figure 1: Age distribution of patients

Table 2: Sex distribution of patients

Sex	No. of cases	Percentage
FEMALE	54	79.4%
MALE	14	20.6%
Total	68	100.0%

Out of the 68 patients studied, 54 (79.4%) patients were females whereas 14 patients were male constituting 20.6% of total. Male to female ratio is 1:3.8.

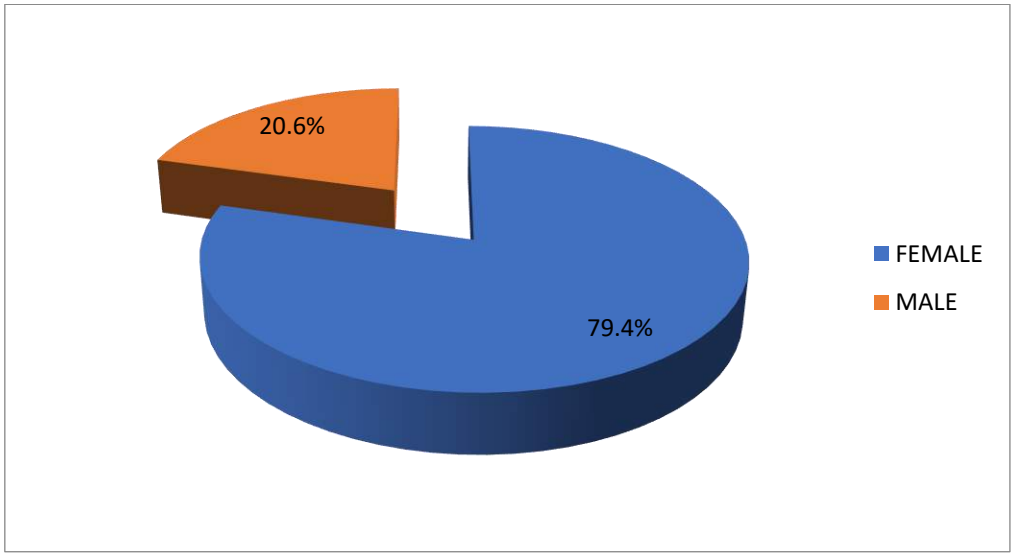


Figure 2: Sex distribution of patients

Table 3: Distribution according to duration of symptoms

Duration of symptoms	No. of patients	Percentage
≤1 year	8	11.7%
1.1-2 years	21	30.8%
2.1-3 years	20	29.4%
3.1-5 years	10	14.7%
>5	9	13.2%
Total	68	100%

11.7% underwent TKR after 1 year of initiation of symptoms. Maximum 30.8% underwent surgery within 1.1-2 years of start of symptoms. 29.4% underwent surgery between 2.1-3 years while 14.7% underwent surgery during 31.-5 years. Only 13.2% patients underwent surgery more than 5 years after the initiation of symptoms.

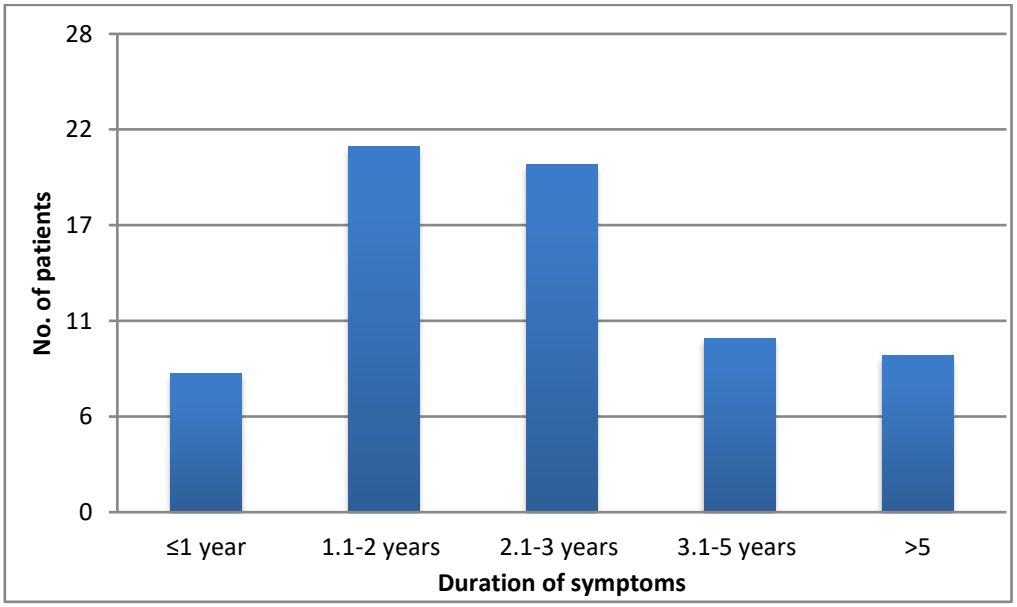


Figure 3: Distribution of patients according to duration of symptoms

Table 4: Distribution of patients according to diagnosis

Diagnosis	No. of cases	Percentage
OA + RA	1	1.5%
OSTEOARTHRITIS	67	98.5%
Total	68	100.0%

It was observed that in 98.5% of patients were diagnosed with osteoarthritis while 1.5% were diagnosed with osteoarthritis and rheumatoid arthritis.

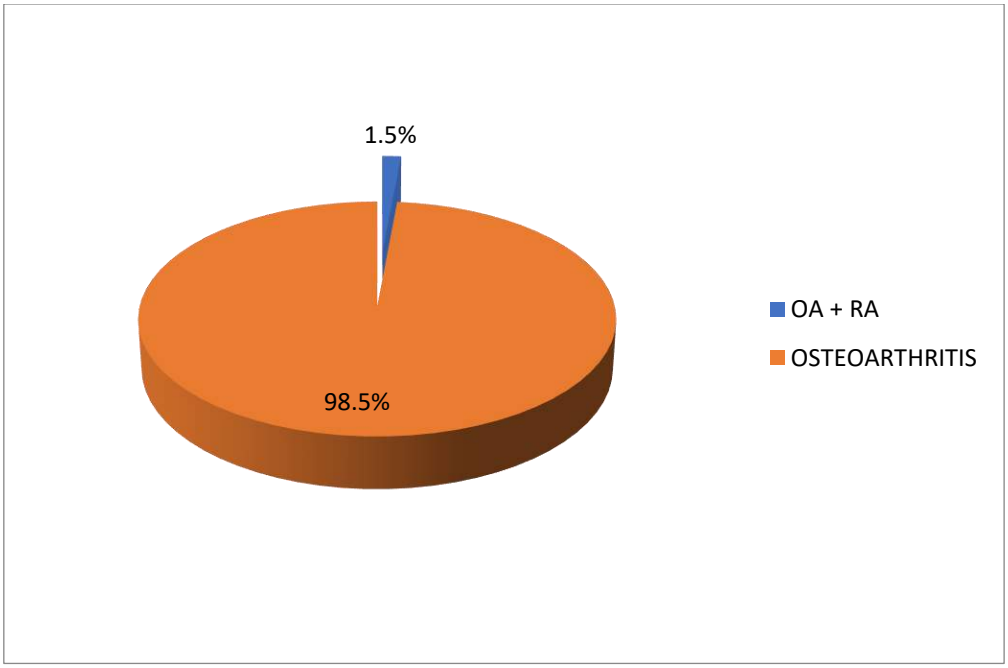


Figure 4: Distribution of patients according to diagnosis

Table 5: Distribution with respect to side operated

Unilateral /Bilateral	No. of cases	Percentage
BILATERAL	38	55.9
UNILATERAL (LEFT)	18	26.5
UNILATERAL (RIGHT)	12	17.6
Total	68	100.0

55.9% patients (38) underwent bilateral knee replacement, 26.5% patients (18) with left side total knee replacement and 17.6% patients (12) with right sided total knee replacement.

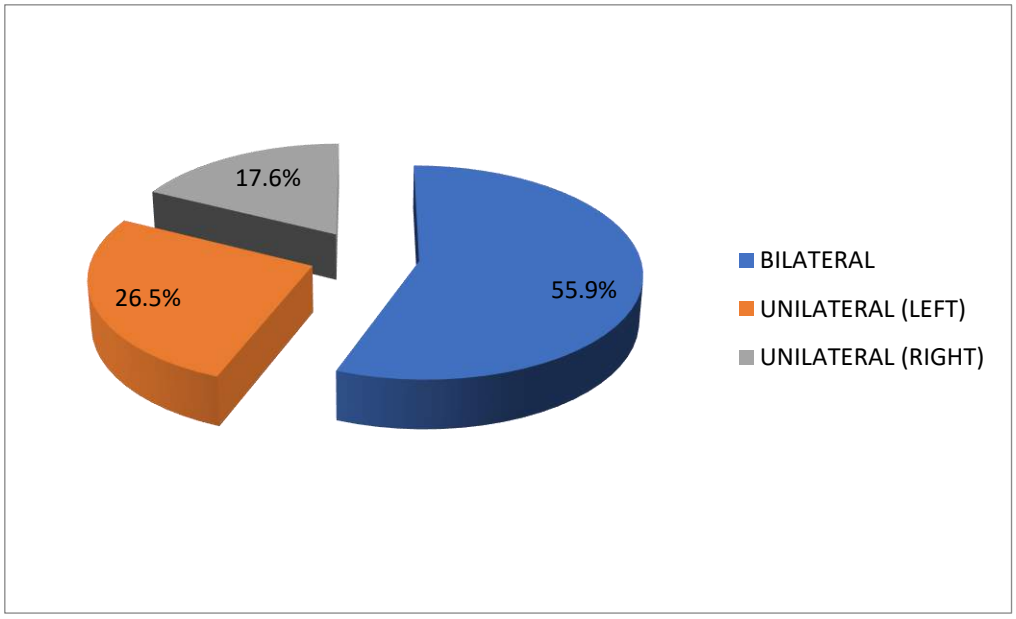


Table 5: Distribution with respect to side operated

Table 6: Distribution of Patients with respect to Patellar resurfacing

PATELLAR RESURFACING	No. of cases	Percentage
NOT DONE	54	79.4%
YES (BILATERAL)	6	8.8%
YES (LEFT)	8	11.8%
Total	68	100.0%

In 54(79.4%) patients patellar resurfacing was not performed while in 14(20.6%) it was performed. In 11.8% it was performed on the left side and In 8.8% it was done bilaterally.

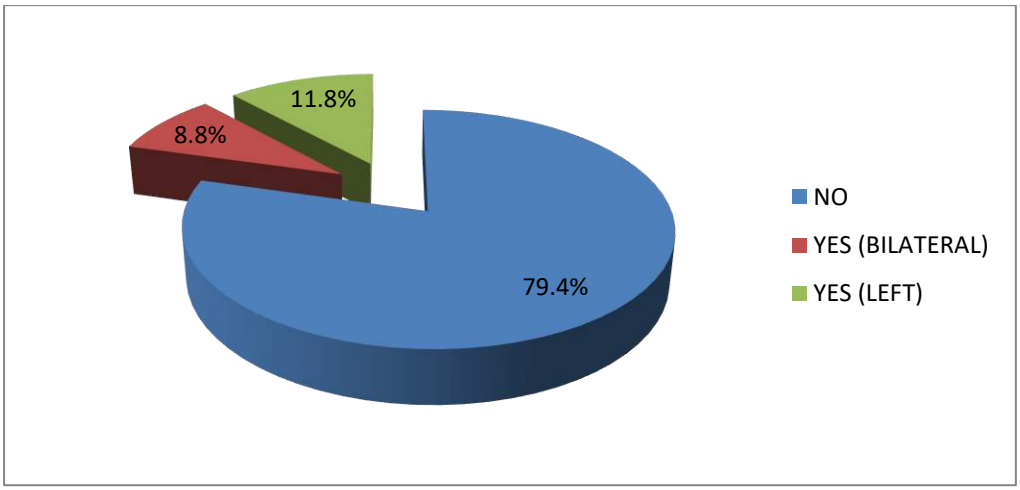


FIGURE 6: Distribution of Patients with respect to Patellar resurfacing

Table 7: Preoperative and postoperative WOMAC score

	N	Minimum	Maximum	Mean	Std. Deviation
WOMAC PREOP	68	75.00	88.00	82.38	1.99
WOMAC POSTOP 4 WEEKS	68	17.00	43.00	29.00	5.97
WOMAC POSTOP 24 WEEKS	68	0.00	11.00	2.93	3.11

Mean pre-op WOMAC score of patients was 82.38±1.99 (out of 68 patients) with a range of 75-88. Mean post op- WOMAC score at 4 week was 29 ±5.97 with a range of 17-43, at 24 weeks was 2.93±3.11 with a range of 0-11.

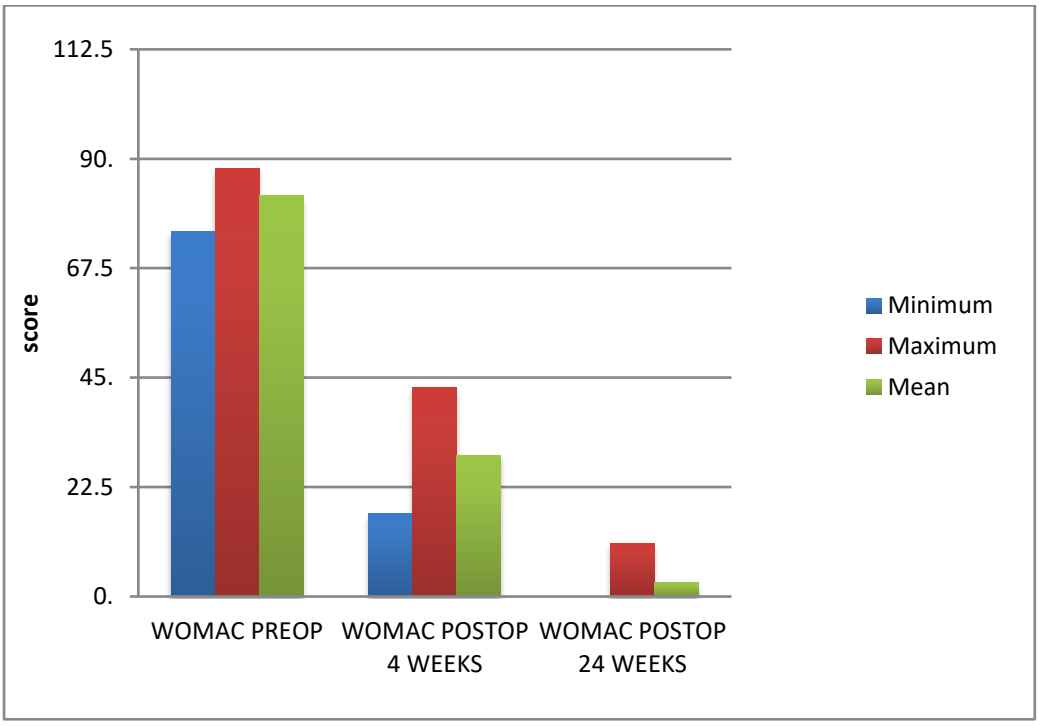


Figure 7: Preoperative and postoperative WOMAC score

Table 8: Comparison of Preoperative and postoperative WOMAC score at 4 weeks

	Mean	SD	Std. Error Mean	t	p-value	Mean difference	SD difference
WOMAC PREOP	82.38	1.99	0.24	76.438	0.001	53.38	5.76
WOMAC POSTOP 4 WEEKS	29.00	5.97	0.72				

Significant difference was observed on comparing the WOMAC score preoperative and 4 weeks after surgery with WOMAC score after 4 weeks (29 ±5.97) being significantly less then preoperative WOMAC score (82.38±1.99)

82.38±1.99 (out of 68 patients) with a range of 75-88. Mean post op-WOMAC

score at 4 week was 29 ±5.97 with a range of 17-43, at 24 weeks was 2.93±3.11

with a range of 0-11.

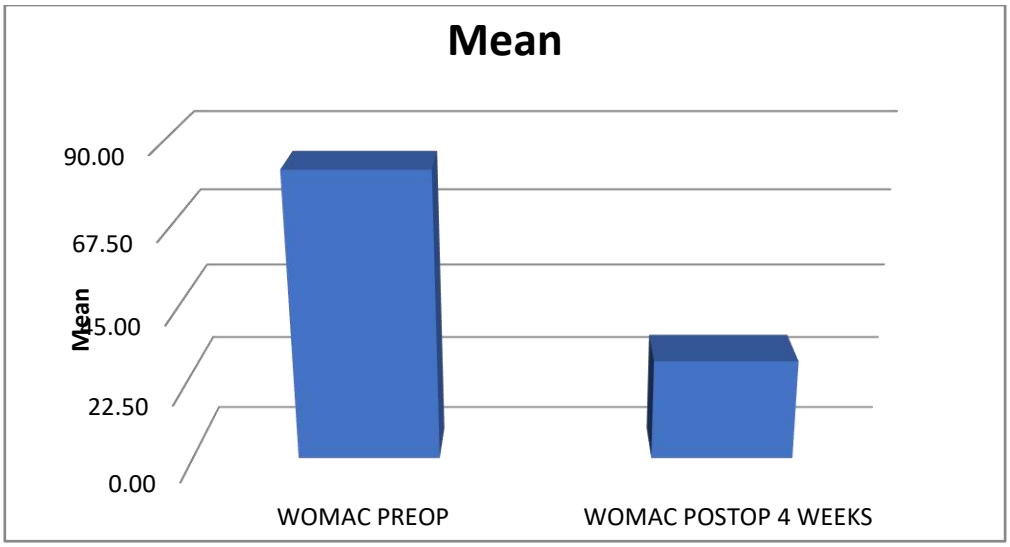


Figure 8: Comparison of Preoperative and postoperative WOMAC score at 4 weeks

Table 9: Comparison of Preoperative and postoperative WOMAC score at 24 weeks

	Mean	SD	Std. Error Mean	t	p-value	Mean difference	SD difference
WOMAC PREOP	82.38	1.99	0.24	202.582	0.001	79.46	3.23
WOMAC POSTOP 24 WEEKS	2.93	3.11	0.38				

Significant difference was observed on comparing the WOMAC score preoperative and 4 weeks after surgery with WOMAC score after 24 weeks (2.93±3.11) being significantly less then preoperative WOMAC score (82.38±1.99)

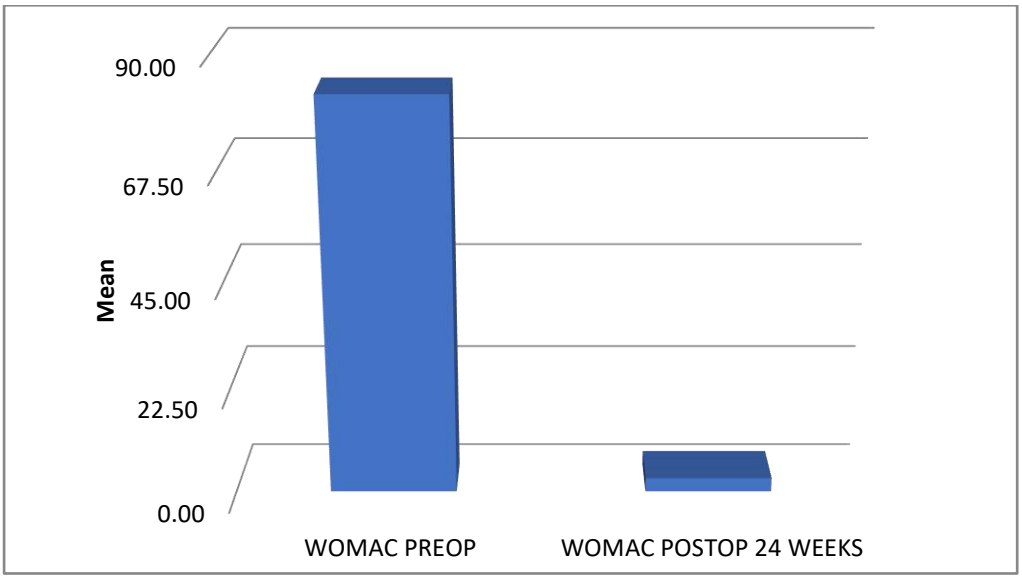


Figure 9: Comparison of Preoperative and postoperative WOMAC score at 24 weeks

Table 10: Comparison postoperative WOMAC score at 4 weeks and 24 weeks

	Mean	SD	Std. Error Mean	t	p-value	Mean difference	SD difference
WOMAC POSTOP 4 WEEKS	29.00	5.97	0.72	48.102	0.001	26.07	4.47
WOMAC POSTOP 24 WEEKS	2.93	3.11	0.38				

Significant difference was observed on comparing the WOMAC score between 4 weeks and 24 weeks after surgery with WOMAC score after 24 weeks (2.93±3.11) being significantly less then WOMAC score at 4 weeks (29 ±5.97)

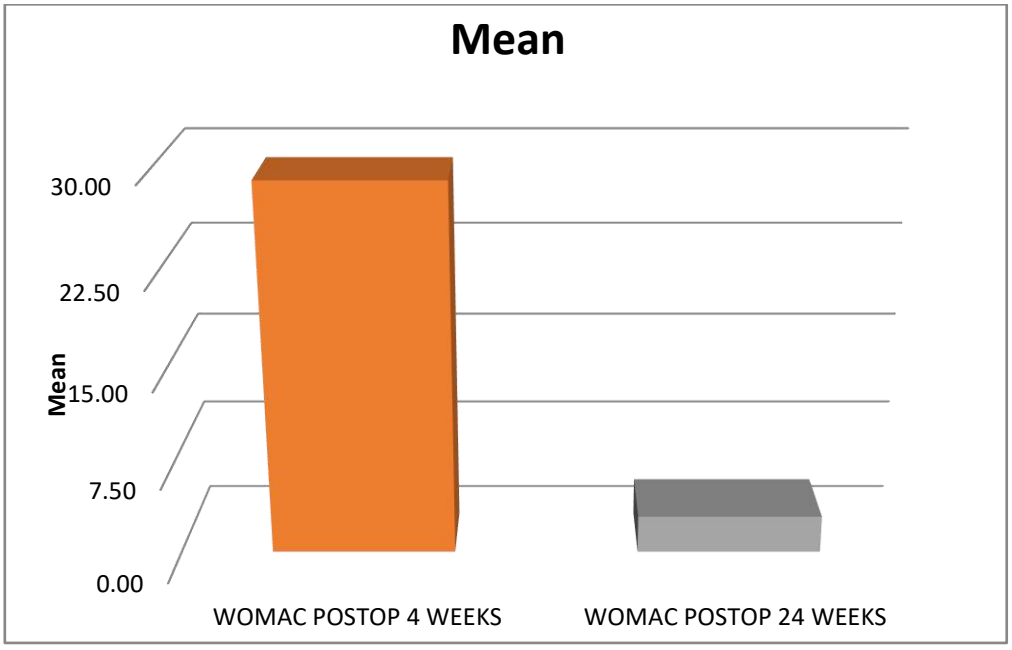


Figure 10: Comparison postoperative WOMAC score at 4 weeks and 24 weeks

Table 11: Association of Patellar resurfacing with age groups

AGE GROUP	PATELLAR RESURFACING				Total	Chi-square value	p-value
	NO		YES				
< 60	22	40.7%	5	35.7%	27	**0.11**	**0.94**
61-70	25	46.3%	7	50.0%	32		
> 70	7	13.0%	2	14.3%	9		
Total	54	100.0%	14	100.0%	68		
Mean age	62.85±7.43		62.21±8.16		62.72 ±7.53	0.280 (t-value)	0.780

No significant association was observed on comparing two groups with respect to age groups.

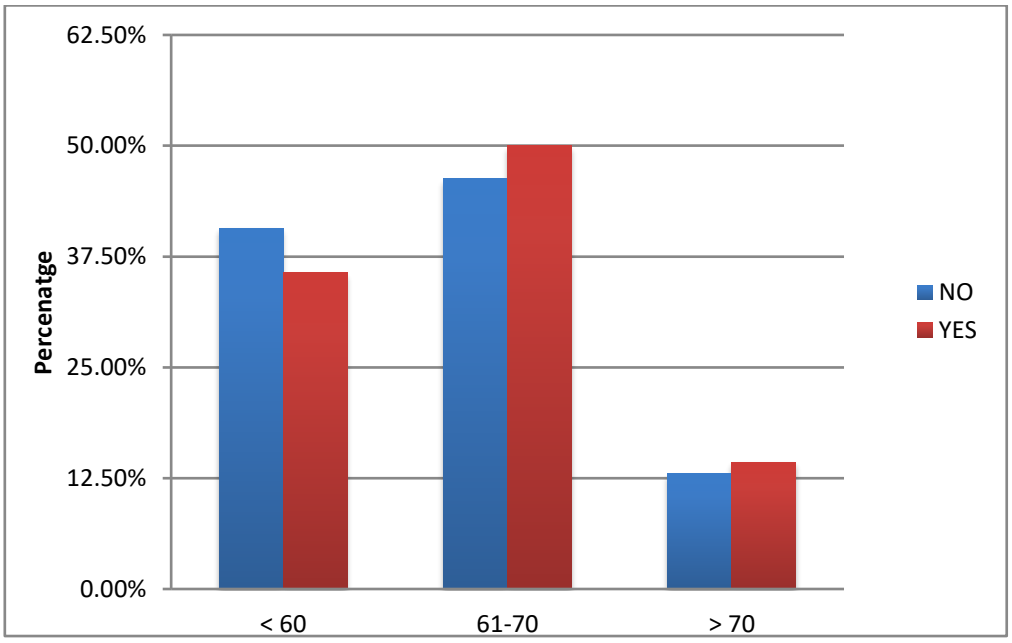


Figure 11: Association of Patellar resurfacing with age groups

Table 12: Association of Patellar resurfacing with age groups

Gender	PATELLAR RESURFACING				Total	Chi-square value	p-value
	NO		YES				
FEMALE	42	77.8%	12	85.7%	54	**0.428**	**0.513**
MALE	12	22.2%	2	14.3%	14		
Total	54	100.0%	14	100.0%	68		

No significant association was observed on comparing two groups with respect to Sex.

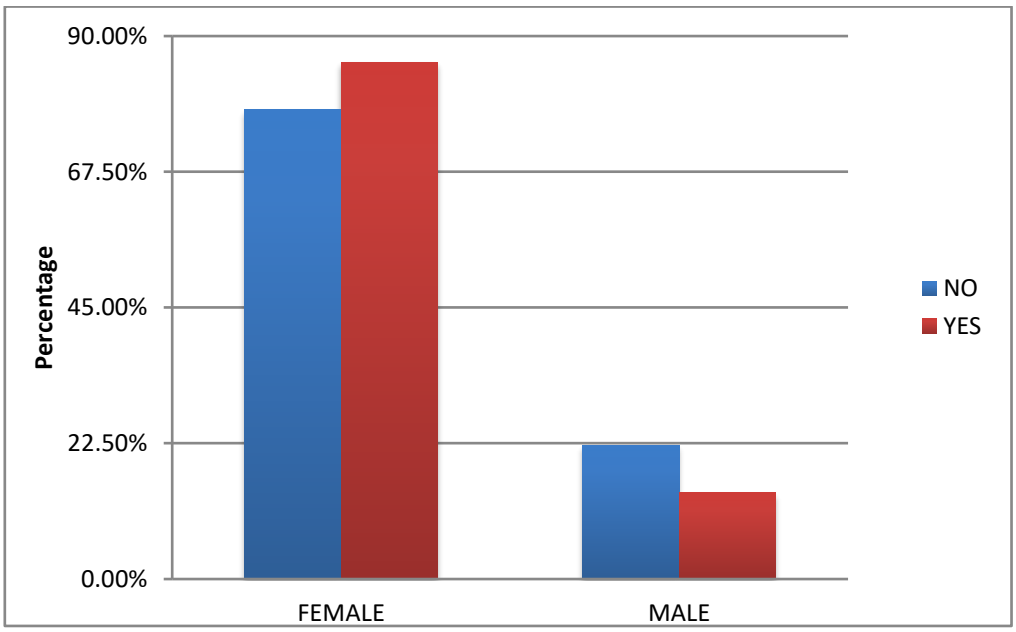


Figure 12: Association of Patellar resurfacing with age groups

Table 13: Association of Patellar resurfacing with duration of symptoms

Duration of symptoms	PATELLAR RESURFACING				Total	Chi-square value	p-value
	NO		YES				
< 2years	24	44.4%	5	35.7%	29	**0.346**	**0.556**
> 2years	30	55.6%	9	64.3%	39		
Total	54	100.0%	14	100.0%	68		

No significant association was observed on comparing two groups with respect to Sex.

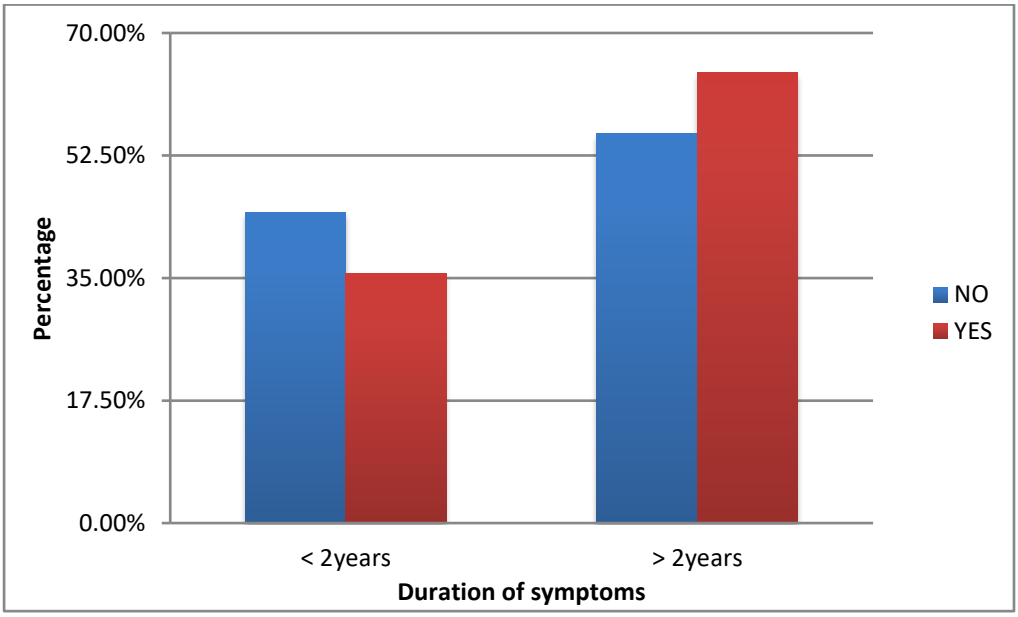


Figure 13: Association of Patellar resurfacing with duration of symptoms

Table 14: Association of Patellar resurfacing with site

Site	PATELLAR RESURFACING				Total	Chi-square value	p-value
	NO		YES				
BILATERAL	32	59.3%	6	42.9%	38	9.9	.007
UNILATERAL (LEFT)	10	18.5%	8	57.1%	18		
UNILATERAL (RIGHT)	12	22.2%	0	0.0%	12		
	54	100.0%	14	100.0%	68		

Significant association was observed among patellar resurfacing and site. It was observed that on left side TKR had more patellar resurfacing (57.1%) was performed than bilaterally (42.9%) and right side (0%) (p=.007).

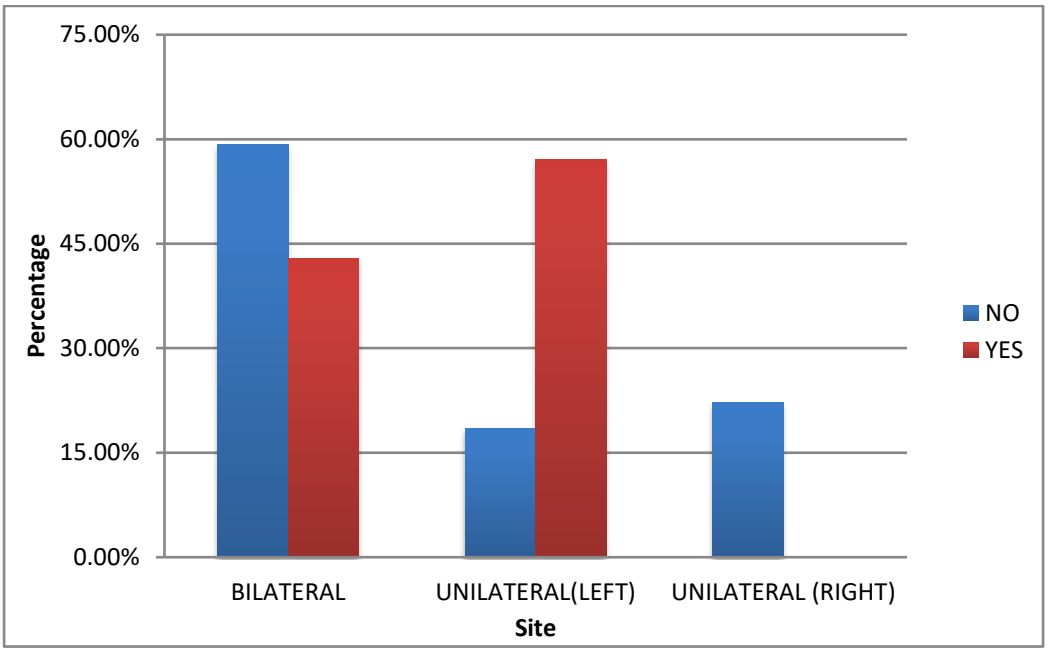


Figure 14: Association of Patellar resurfacing with site

Table 15: Comparison of WOMAC score in patient with and without patellar resurfacing

PATELLAR RESURFACING	NO		YES		t	p-value
	Mean	SD	Mean	SD		
WOMAC PREOP	82.48	2.05	82.00	1.71	0.807	0.423
WOMAC POSTOP 4 WEEKS	29.61	5.92	26.64	5.77	1.681	0.098
WOMAC POSTOP 24 WEEKS	3.35	3.19	1.29	2.16	2.286	0.025
WOMAC POSTOP 4 WEEKS difference	52.87	5.71	55.36	5.73	-1.452	0.151
WOMAC POSTOP 24 WEEKS difference	79.13	3.39	80.71	2.20	-1.655	0.103

It was observed that on comparing the WOMAC score between the patients who underwent patellar resurfacing and did not underwent patellar resurfacing, it was observed that at 24 weeks follow up the WOMAC score in patients with patellar resurfacing was significantly less (1.29±2.16) than the other group (3.35±3.19). However, at 4 months post op follow up the score did not show any significant difference.

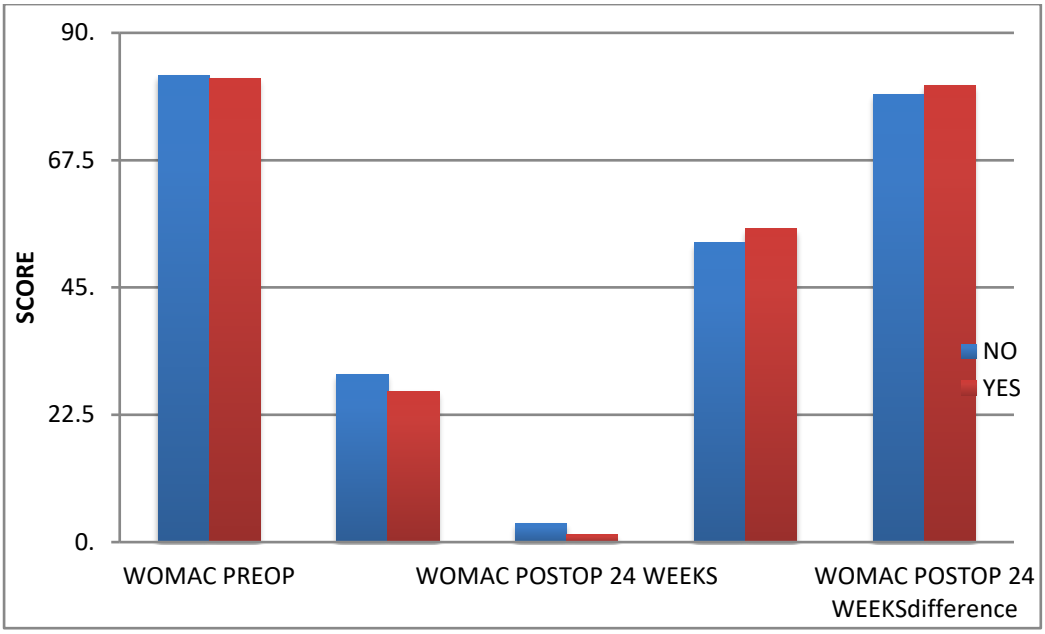


Figure 15: Comparison of WOMAC score in patient with and without patellar resurfacing

DISCUSSION

The present study was conducted in the department of Orthopaedics, Dayanand Medical College and Hospital, over a period of two years from 1 September, 2019 to 7 July, 2021. Total of 68 patients were included in the study. The reason for less cases could be attributed to the COVID -19 as it had a substantial decrease in knee replacement surgery.

TKA is one option to relieve pain and to restore function to an arthritic knee[43-45]. The most common reason for knee replacement is that other treatments such as: weight loss, exercise/physical therapy, medicines, and injections have failed to relieve arthritis-associated knee pain. The decision to resurface the patella during TKA remains controversial. We have performed this clinical trial study to examine the efficacy and short term outcomes of TKA with and without patellar resurfacing[46-48].

In the present study Majority of patients were in the age group of 61-70 year (32 patients, 47.1%) (Table 1). The age range of the patient was 44-79 years with mean age being 62.72±7.53years. A study conducted by Kaseeb et al.[32] on 50 patients comparing results between Patellar Resurfacing and Non-resurfacing in Total Knee Arthroplasty also reported the mean age of the 64.8 ± 7.8 years. In a study by ha et al the mean age was 65.2 ± 5.4 with age range 58–70 years[34].

In present study the female predominance was observed with Male to female ratio of 1:3.8. Kaseeb et al.[32] in their study observed male:female to be 1:5. Ha et al.[34] in their study reported that there were 38(63.3%) women and 22 (32.7%) men in their study .

OA is the most prevalent chronic disease affecting more than 59% of Americans older than 65 years, and this disease affects a higher percentage of women than men [49,50]. The number of women undergoing TKA continues to rise at a higher rate than men[49]. Meta-analysis and meta-regression have been used to better define site-specific gender differences in prevalence, incidence, and severity of OA [51]. Men tend to have a reduced risk of OA of the knees, whereas women, especially those older than 55 years, reportedly have more severe disease in the knees at presentation. This gender difference in disease presentation

has been associated with a number of factors, including hormonal influences [52] and cartilage thickness[53]. Both men and women have an increased risk of developing OA of the knees with increased body weight[54-56].

Majority patients (42.5%) in present study had symptoms for less than 2 years in present study. The patients desire to move to the surgical treatment early in disease could be due to awareness regarding the procedure. Also being a common and cost-effective intervention associated with generally favourable outcomes it is now being preferred by population suffering with a chronic and disabling knee pain. It has been observed that in India there has been a steady rise in the number of TKRs being reported to the registry from a mere 1019 in 2006 to around 27,000 in 2019. Also analysis of operation funding brings light to the fact that of the reported surgeries to the IJR in the period from April 2016 to August 2017 and April 2019, majority of surgeries were covered under insurance[57].

In present study 98.5% of patients were diagnosed with osteoarthritis while 1.5% were diagnosed with osteoarthritis and rheumatoid arthiritis. This data was in accordance to the survey done by Vaidya et al.[57] where also an overwhelming majority of the patients (approx. 98.5%) were diagnosed with osteoarthritis knee and 1.15% patients had rheumatoid arthiritis. In a study by Metsna et al. also reported majority (90.7%) of the knees involved in the study suffered from osteoarthritis, 8.2% from rheumatoid arthritis, and the remaining 1.1% were impaired either by ankylosing spondylitis, psoriatic arthritis or knee dysplasia[58].

Osteoarthritis of the knee is a relatively prevalent condition that can progress to a point where it is debilitating. It adversely affects the patient‘s quality of life due to pain and decreased function. While there are many modes of treatment, including conservative and surgical management, the definitive method of treatment is joint replacement. This surgical procedure has become more common due to its effectiveness in alleviating pain and improving function, and will continue to play a key role in the management of osteoarthritis[59].

55.9% patients (38) underwent bilateral knee replacement, 26.5% patients

(18) with left side total knee replacement and 17.6% patients (12) with right sided total knee replacement. Thus more left side overall knees were operated then right side. Similar results were shown by Ha et al.[34] where the number of left knees was greater than right side, however kaseeb et al.[32] the laterality was equally distributed. In a study by chawla et al.[35] arthroplasty were performed in 57 right sided knees as compared to left sided, which were 43 which was in discordance to the present study.

In present study in 54 (79.4%) patients patellar resurfacing was not performed while in 14(20.6%) it was performed. No significant association was observed on comparing two groups with respect to age groups, gender and duration of symptoms in patients who underwent patellar resurfacing and who did not underwent patellar resurfacing. Similar findings were obtained by Ikejiani et al.[60], who observed no significant difference between two groups with respect to these parameters. In a study by kaseeb et al.[32] also No significant differences were seen in the baseline characteristics between the resurfaced and non-resurfaced groups, including age (*P=0.92*), gender (*P=1.00*). In a study by Aunan et al also the baseline characteristic were same for both the groups[8].

WOMAC score was used in the present study to evaluate the functional outcome. The WOMAC (Western Ontario and McMaster Universities) osteoarthritis index 5-point Likert version was used to detect patients for OA. The WOMAC index is the best validated and most widely used outcome measure in subjects with knee osteoarthritis[61].

In present study Significant difference was observed on comparing the WOMAC score preoperative and WOMAC score after 4 weeks and 24 weeks of surgery with WOMAC score after 4 weeks (29 ±5.97) and 24 weeks ((2.93±3.11) being significantly less then preoperative WOMAC score (82.38±1.99). Also on comparing WOMAC score after 4 weeks and 24 weeks significant improvement in the pain was seen at 24 weeks after surgery.

Budhiparama et al.[62] did a retrospective cohort study in which WOMAC scores were improved significantly from mean of 70.25 to 33.36. In our study WOMAC score pre-operative was 82.38±1.99 and postoperatively at 24 weeks reduced to 2.93±3.11. in a study by Vina et al.[63] also the baseline score was 35.52 ± 17.03 which decreased to 11.86 ± 13.04 after surgery. According to Zoe H.et al study conducted on total 204 patients there was significant improvement with WOMAC scores preoperatively 54.3 +/-14.4 to postoperatively14.5+/-12.1[64]. Chi Jin et al.[65] compared WOMAC score pre operatively and at 1months, 3 months and 6months the mean of which was 45.03 preoperatively and 32, 25 and 21.58 respectively postoperatively. All these studies were in accordance to the present study. According to Baker et al [79] WOMAC scores rose from 39.9 points before surgery to 77.7 points one year after surgery which is in contrast to our study[66].

It was observed that on comparing the WOMAC score between the patients who underwent patellar resurfacing and did not underwent patellar resurfacing, at 24 weeks follow up the WOMAC score in patients with patellar resurfacing was significantly less (1.29±2.16) than the other group (3.35±3.19). However at 4 weeks post op follow up the score did not show any significant difference.

This implies that patients who underwent patellar resurfacing were more satisfied than who did not underwent resurfacing at 4 weeks. The results of the present study were in accordance to study done by Kaseeb et al[32] who showed no significant difference in WOMAC score between the two group pre and postoperatively. The WOMAC score post operatively in their study of patients who underwent resurfacing was 23.80 (16.7) while who underwent resurfacing it was 18.79 (15.7). Though it was less for patients who underwent resurfacing the difference was not significant, but in present study we obtained the significant difference.

Feng et al. in their study demonstrated that, the nonresurfacing group had a higher rate of AKP (13.2% vs 5.2%) and higher rate of postoperative subluxation, the clinical outcome evaluations with the HSS knee score, the patellar score, AKP, patellar complications, and the postoperative WOMAC score were not statistically significantly different

after more than 10 years of follow-up between the patellar resurfacing and nonresurfacing groups[37].

Our result was consistent with studies of the outcome of patellar resurfacing after TKA. This study further indicated the long-term survivorship was not significantly different between the 2 groups both for revision surgery and patellar-related complications. Regarding the studies, more knee surgeons have concluded that it is not necessary on a regular basis to resurface the patella during primary TKA.

SUMMARY AND CONCLUSION

This was a prospective study evaluating the functional outcome in patients undergoing TKA with or without patellar resurfacing from 1 September, 2019 to 7 July, 2021 (including 6 months follow up) at the department of Orthopaedics, Dayanand Medical College and Hospital, Ludhiana. Patients were assessed pre-operatively using a proforma having two parts- to be filled by the clinician and the patient respectively, and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) score. Patients were re-assessed at a 1 Month and 6 Months follow-up period using a proforma having WOMAC Score. The results obtained are given below:

Out of the total 68 patients majority were in the age group of 61-70 year with the mean age being 62.72±7.53years. Male to female ratio is 1:3.8. 11.7% underwent TKR after 1 year of initiation of symptoms. Maximum 30.8% underwent surgery within 1.1-2 years of start of symptoms. 29.4% underwent surgery between 2.1-3 years while 14.7% underwent surgery during 31.-5 years. Only 13.2% patients underwent surgery more than 5 years after the initition of symptoms.

It was observed that in 98.5% of patients were diagnosed with osteoarthritis while 1.5% were diagnosed with osteoarthritis and rheumatoid arthiritis.

55.9% patients underwent bilateral knee replacement, 26.5% patients with left side total knee replacement and 17.6% patients with right sided total knee replacement.

In 79.4% patients patellar resurfacing was not performed while in 20.6% it was performed. In 11.8% it was performed on the left side. In 8.8% it was done bilaterally.

Mean pre-op WOMAC score of patients was 82.38±1.99 with a range of 75-88. Mean post op- WOMAC score at 4 week was 29 ±5.97 with a range of 17-43, at 24 weeks was 2.93±3.11 with a range of 0-11.

Significant difference was observed on comparing the WOMAC score preoperative and 4 weeks after surgery with WOMAC score after 4 weeks being significantly less then preoperative WOMAC score.

Significant difference was observed on comparing the WOMAC score preoperative and 4 weeks after surgery with WOMAC score after 24 weeks being significantly less then preoperative WOMAC score.

Significant difference was observed on comparing the WOMAC score between 4 weeks and 24 weeks after surgery with WOMAC score after 24 weeks being significantly less then WOMAC score at 4 weeks.

No significant association was observed on comparing two groups with respect to Sex, age, site, duration of symptoms.

It was observed that on comparing the WOMAC score between the patients who underwent patellar resurfacing and did not underwent patellar resurfacing, it was observed that at 24 weeks follow up the WOMAC score in patients with patellar resurfacing was significantly less (1.29±2.16) than the other group (3.35±3.19). However at 4 months post op follow up the score did not show any significant difference.

Conclusion

Our result was consistent with studies of the outcome of patellar resurfacing after TKA. This study further indicated the long-term survivorship was not significantly different between the 2 groups both for revision surgery and patellar-related complications. Regarding the studies, more knee surgeons have concluded that it is not necessary on a regular basis to resurface the patella during primary TKA.

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S.No.	MRD No	NAME	AGE (YEARS)	Sex	Date of Surgery	Duration of symptoms	Diagnosis	Date of Discharge	Unilateral /Bilateral	WOMAC PREOP	WOMAC POSTOP 4	WOMAC POSTOP 24	PATELLAR RESURFACING
1	268090	RK	73	FEMALE	06-09-19	4 YEARS	OSTEOARTHRITIS	11-09-19	BILATERAL	84	34	0	NO
2	804726	DK	69	FEMALE	08-09-19	7 YEARS	OSTEOARTHRITIS	13-09-19	BILATERAL	81	33	8	NO
3	543344	MK	64	FEMALE	07-10-19	2 YEARS	OSTEOARTHRITIS	11-10-19	UNILATERAL (RIGHT)	80	40	11	NO
4	826901	A	67	FEMALE	11-10-19	6 YEARS	OSTEOARTHRITIS	16-10-19	BILATERAL	88	28	8	NO
5	840848	JD	68	FEMALE	02-11-19	3 YEARS	OSTEOARTHRITIS	07-11-19	BILATERAL	83	27	6	NO
6	43583	MK	60	FEMALE	30-12-19	2 YEARS 6 MONTHS	OSTEOARTHRITIS	03-01-20	BILATERAL	75	27	5	NO
7	872560	RSS	72	MALE	04-01-20	2 YEARS	OSTEOARTHRITIS	08-01-20	BILATERAL	84	37	6	NO
8	879284	NS	61	MALE	11-01-20	8 MONTHS	OSTEOARTHRITIS	15-01-20	UNILATERAL (RIGHT)	84	32	5	NO
9	880790	S	64	FEMALE	21-01-20	3 YEARS	OSTEOARTHRITIS	26-01-20	BILATERAL	83	29	1	NO
10	884953	MB	51	FEMALE	23-01-20	1 YEAR 6 MONTHS	OSTEOARTHRITIS	28-01-20	BILATERAL	82	31	5	NO
11	252502	R	58	FEMALE	29-01-20	1 YEAR 6 MONTHS	OSTEOARTHRITIS	03-02-20	BILATERAL	82	20	0	NO
12	889353	SS	66	MALE	30-01-20	2 YEARS 6 MONTHS	OSTEOARTHRITIS	03-02-20	BILATERAL	80	24	0	NO
13	5175	K	44	FEMALE	04-02-20	7 MONTHS	OSTEOARTHRITIS	08-02-20	UNILATERAL (RIGHT)	82	34	1	NO
14	820663	BK	53	FEMALE	06-02-20	10 MONTHS	OSTEOARTHRITIS	11-02-20	BILATERAL	82	32	3	NO
15	891459	MK	77	FEMALE	07-02-20	4 YEARS	OSTEOARTHRITIS	12-02-20	BILATERAL	85	37	8	NO
16	897395	UN	70	MALE	15-02-20	6 YEARS	OSTEOARTHRITIS	21-02-20	BILATERAL	81	37	6	NO
17	636015	GK	52	FEMALE	18-02-20	11 MONTHS	OSTEOARTHRITIS	22-02-20	UNILATERAL (RIGHT)	83	27	5	NO
18	903197	AM	53	FEMALE	22-02-20	1 YEAR 3 MONTHS	OSTEOARTHRITIS	27-02-20	BILATERAL	84	30	1	NO
19	905266	KB	73	FEMALE	25-02-20	2 YEARS	OSTEOARTHRITIS	01-03-20	BILATERAL	80	27	0	NO
20	889880	AK	79	FEMALE	29-02-20	2 YEARS 6 MONTHS	OSTEOARTHRITIS	05-03-20	UNILATERAL (RIGHT)	81	35	6	NO
21	909261	SB	70	FEMALE	03-03-20	4 YEARS	OSTEOARTHRITIS	07-03-20	UNILATERAL (RIGHT)	80	32	1	NO
22	897457	SB	60	FEMALE	03-03-20	1 YEAR 8 MONTHS	OSTEOARTHRITIS	08-03-20	BILATERAL	85	34	0	NO
23	907421	SR	55	FEMALE	05-03-20	1 YEAR 6 MONTHS	OSTEOARTHRITIS	10-03-20	BILATERAL	82	26	0	NO
24	913425	GK	76	FEMALE	12-03-20	2 YEARS 6 MONTHS	OSTEOARTHRITIS	16-03-20	UNILATERAL (LEFT)	85	32	5	NO
25	908313	SK	58	FEMALE	13-03-20	6 YEARS	OSTEOARTHRITIS	18-03-20	BILATERAL	82	30	6	NO
26	907753	GK	51	FEMALE	14-03-20	3 YEARS	OSTEOARTHRITIS	18-03-20	BILATERAL	80	29	5	NO
27	917430	SB	70	FEMALE	17-03-20	2YEARS 5 MONTHS	OSTEOARTHRITIS	21-03-20	UNILATERAL (LEFT)	83	37	8	NO
28	945208	DK	62	MALE	21-07-20	3 YEARS	OSTEOARTHRITIS	26-07-20	BILATERAL	84	35	6	NO
29	841460	AK	67	FEMALE	20-09-20	3 YEARS 6 MONTHS	OSTEOARTHRITIS	24-09-20	UNILATERAL (LEFT)	82	27	0	YES (LEFT)
30	973982	AJ	59	FEMALE	11-10-20	2YEARS 5 MONTHS	OSTEOARTHRITIS	25-09-20	UNILATERAL (RIGHT)	83	33	0	NO
31	442561	AR	62	FEMALE	20-10-20	2 YEARS	OSTEOARTHRITIS	26-10-20	BILATERAL	81	26	0	YES (BILATERAL)
32	977452	PR	61	FEMALE	20-10-20	2 YEARS 6 MONTHS	OSTEOARTHRITIS	26-10-20	BILATERAL	82	22	0	NO
33	977668	GS	66	MALE	21-10-20	4 YEARS	OSTEOARTHRITIS	10-12-20	UNILATERAL (LEFT)	83	34	6	NO
34	994807	MS	65	FEMALE	05-12-20	6 YEARS	OSTEOARTHRITIS	10-12-20	BILATERAL	85	32	0	NO
35	1078447	SM	58	FEMALE	08-04-21	1 YEAR	OSTEOARTHRITIS	13-04-21	UNILATERAL (LEFT)	83	39	8	NO
36	1078597	SR	60	FEMALE	08-04-21	1 YEAR 5 MONTHS	OSTEOARTHRITIS	13-04-21	BILATERAL	83	29	7	NO
37	1060622	YPK	75	MALE	10-04-21	5 YEARS	OSTEOARTHRITIS	15-04-21	BILATERAL	81	38	6	YES (BILATERAL)
38	1043188	IR	55	FEMALE	13-04-21	6 YEARS	OA + RA	17-04-21	UNILATERAL (LEFT)	86	31	4	YES (LEFT)
39	1065268	MB	70	FEMALE	14-04-21	3 YEARS	OSTEOARTHRITIS	18-04-21	UNILATERAL (LEFT)	81	30	2	NO
40	1085299	PK	53	FEMALE	15-04-21	1 YEAR 6 MONTHS	OSTEOARTHRITIS	19-04-21	UNILATERAL (LEFT)	83	34	4	YES (LEFT)
41	1078369	SK	62	FEMALE	17-04-21	2 YEARS 6 MONTHS	OSTEOARTHRITIS	22-04-21	BILATERAL	81	24	0	YES (BILATERAL)

S.No.	MRD No	NAME	AGE (YEARS)	Sex	Date of Surgery	Duration of symptoms	Diagnosis	Date of Discharge	Unilateral /Bilateral	WOMAC PREOP	WOMAC POSTOP 4	WOMAC POSTOP 24	PATELLAR RESURFACING
42	1045800	SJ	63	FEMALE	19-04-21	2 YEARS	OSTEOARTHRITIS	24-04-21	BILATERAL	83	21	0	NO
43	1116203	KK	45	FEMALE	03-06-21	8 MONTHS	OSTEOARTHRITIS	07-06-21	UNILATERAL (LEFT)	80	25	0	YES (LEFT)
44	1117103	PK	60	MALE	04-06-21	2 YEARS 6 MONTHS	OSTEOARTHRITIS	09-06-21	BILATERAL	82	30	2	NO
45	1117971	SK	53	FEMALE	05-06-21	11 MONTHS	OSTEOARTHRITIS	10-06-21	BILATERAL	83	27	4	NO
46	26983	RA	70	MALE	05-06-21	2 YEARS	OSTEOARTHRITIS	09-06-21	UNILATERAL (RIGHT)	83	28	6	NO
47	25179	BK	62	FEMALE	07-06-21	2 YEARS	OSTEOARTHRITIS	11-06-21	UNILATERAL (RIGHT)	83	18	0	NO
48	9005	SS	69	MALE	08-06-21	1 YEAR 6 MONTHS	OSTEOARTHRITIS	12-06-21	UNILATERAL (LEFT)	80	26	0	YES (LEFT)
49	1119445	RS	58	FEMALE	10-06-21	4 YEARS	OSTEOARTHRITIS	15-06-21	BILATERAL	84	23	0	YES (BILATERAL)
50	549129	KK	67	FEMALE	12-06-21	2 YEARS 6 MONTHS	OSTEOARTHRITIS	16-06-21	UNILATERAL (LEFT)	82	17	0	YES (LEFT)
51	6463	PK	60	FEMALE	12-06-21	7 YEARS	OSTEOARTHRITIS	16-06-21	UNILATERAL (LEFT)	79	22	0	NO
52	1121203	SK	55	FEMALE	12-06-21	1 YEAR 6 MONTHS	OSTEOARTHRITIS	17-06-21	BILATERAL	83	30	4	NO
53	222179	SS	55	MALE	14-06-21	1 YEAR 6 MONTHS	OSTEOARTHRITIS	17-06-21	UNILATERAL (RIGHT)	83	25	0	NO
54	1122393	SK	60	FEMALE	16-06-21	3 YEARS 6 MONTHS	OSTEOARTHRITIS	21-06-21	BILATERAL	82	23	0	NO
55	1004243	PR	73	FEMALE	18-06-21	3 YEARS	OSTEOARTHRITIS	22-06-21	UNILATERAL (LEFT)	85	41	8	NO
56	1124122	PR	58	FEMALE	19-06-21	1 YEAR	OSTEOARTHRITIS	23-06-21	UNILATERAL (LEFT)	83	34	4	YES (LEFT)
57	1124071	NK	55	FEMALE	20-06-21	1 YEAR 6 MONTHS	OSTEOARTHRITIS	24-06-21	UNILATERAL (LEFT)	80	24	0	NO
58	1126295	S	66	FEMALE	24-06-21	1 YEAR 6 MONTHS	OSTEOARTHRITIS	29-06-21	BILATERAL	80	34	0	NO
59	282989	KR	65	FEMALE	26-06-21	2 YEARS	OSTEOARTHRITIS	30-06-21	UNILATERAL (RIGHT)	82	20	0	NO
60	507963	SK	62	FEMALE	26-06-21	3 YEARS	OSTEOARTHRITIS	01-07-21	BILATERAL	83	20	0	YES (BILATERAL)
61	1128645	SK	74	FEMALE	29-06-21	6 YEARS	OSTEOARTHRITIS	03-07-21	UNILATERAL (LEFT)	80	23	0	YES (LEFT)
62	1128655	HK	64	FEMALE	29-06-21	3 YEARS	OSTEOARTHRITIS	04-07-21	BILATERAL	82	25	0	YES (BILATERAL)
63	146128	DP	70	MALE	30-06-21	5 YEARS	OSTEOARTHRITIS	04-07-21	UNILATERAL (RIGHT)	84	29	4	NO
64	1129758	PK	62	FEMALE	01-07-21	2 YEARS 6 MONTHS	OSTEOARTHRITIS	06-07-21	BILATERAL	83	23	0	NO
65	1130225	RN	66	MALE	02-07-21	6 YEARS 6 MONTHS	OSTEOARTHRITIS	07-07-21	BILATERAL	87	43	8	NO
66	1130800	MLS	64	MALE	02-07-21	3 YEARS 6 MONTHS	OSTEOARTHRITIS	06-07-21	UNILATERAL (LEFT)	82	23	0	NO
67	1132017	RR	58	FEMALE	06-07-21	2 YEARS	OSTEOARTHRITIS	11-07-21	BILATERAL	82	19	2	NO
68	1126677	AJ	62	FEMALE	07-07-21	3 YEARS	OSTEOARTHRITIS	11-07-21	UNILATERAL (LEFT)	83	24	4	NO

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No. BFUHS/2K21p-TH/ 5261

Date 30/4/2021

The Principal,
DMC,Ludhiana

Subject: **Approval of Plan of Thesis.**

This is to inform you that the Faculty of Medical Sciences in its meeting held on 22.01.2021 has approved the plan of thesis of **Dr. Manvinder Singh**, a student of your college for **MS Orthopaedics** along with the names of Supervisor/Co-Supervisor as under:-

Topic Plan of Thesis
Comparative analysis of functional outcome in patients who undergo total knee arthroplasty with or without patellar resurfacing

Supervisor
Dr. Rajnish Garg
Prof. & Head,
Dept. of Orthopaedics,
DMCH, Ludhiana.

Co-Supervisor
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Assoc. Prof.,
Dept. of Orthopaedics,
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The student has to submit the three copies of thesis (along with PDF format) , to the Controller of Examinations, BFUHS, Faridkot, at least six months before the commencement of theory examination, if he/she is otherwise eligible to take the examination. He /She must directed to attach a photocopy of this letter with the forwarding letter while submitting thesis to the University along with the letter of approval of University for change of supervisor/Co-Supervisor, change of topic,(if any).

S P Singh

Dr. S P Singh MS(Oph)
Controller of Examinations

Note :

1. ***If any discrepancy found regarding topic of thesis or Supervisor/Co-Supervisor, inform undersigned within one month after issue of this letter.***
2. *The student may submit the thesis as per the schedule already conveyed i.e for May/June examination 30th Nov of the preceding the year of examination and for Nov/Dec examination 31st May of the year of examination.*

COMPARATIVE ANALYSIS OF FUNCTIONAL OUTCOME IN PATIENTS WHO UNDERGO TOTAL KNEE ARTHROPLASTY WITH OR WITHOUT PATELLAR RESURFACING

THESIS PROPOSAL

FOR APPROVAL OF SUBJECT OF THESIS TO BE SUBMITTED

IN PARTIAL FULFILMENT OF THE REQUIREMENTS

FOR THE DEGREE OF

MASTER OF SURGERY

IN

ORTHOPEDICS

OF THE

BABA FARID UNIVERSITY OF HEALTH SCIENCES

FARIDKOT

NOVEMBER, 2019

DR. MANVINDER SINGH

DEPARTMENT OF ORTHOPEDICS

DAYANAND MEDICAL COLLEGE AND HOSPITAL

LUDHIANA

ABSTRACT OF PLAN OF THESIS

Title	COMPARATIVE ANALYSIS OF FUNCTIONAL OUTCOME IN PATIENTS WHO UNDERGO TOTAL KNEE ARTHROPLASTY WITH OR WITHOUT PATELLAR RESURFACING.
For the degree of	M.S. Orthopedics
Name of the candidate	Dr. Manvinder Singh
Supervisor	Dr. Rajnish Garg, Professor & Head, Department of Orthopedics, DMCH, Ludhiana
Co-supervisor	Dr. Pankaj Mahindra, Associate Professor, Department of Orthopedics
Institution	Dayanand Medical College & Hospital, Ludhiana
University	Baba Farid University of Health Sciences, Faridkot

Introduction: TKA is a reliable procedure to correct severe knee deformities, relieve pain and improve knee function in cases of arthritis. Anterior knee pain is a common reason for patient dissatisfaction post primary TKA. PR is a proposed addition to the procedure of TKA to counter this complication.

Aim of Study: To assess the benefits and complications of patellar resurfacing in patients undergoing primary TKA.

Materials & methods: Comparative, prospective and retrospective analysis in patients undergoing TKA with PR and without PR in terms of overall satisfaction and complications using WOMAC score over a period of 6 months.

Keywords: TKA : Total Knee Arthroplasty, PR : Patellar Resurfacing, WOMAC : Western Ontario and McMaster Universities Osteoarthritis Index

(Signature)	(Signature)	(Signature)	(Signature)
Candidate	Co-supervisor	Supervisor	Principal

CERTIFICATE OF FACILITIES AVAILABLE

This is to certify that the facilities for work on the subject of thesis titled **"COMPARATIVE ANALYSIS OF FUNCTIONAL OUTCOME IN PATIENTS WHO UNDERGO TOTAL KNEE ARTHROPLASTY WITH OR WITHOUT PATELLAR RESURFACING."** exist in the Department of Orthopedics, DMC&H, Ludhiana and will be provided to be candidate. We will see that the data being included in the thesis are genuine and is collected by the candidate himself under our supervision and guidance.

Supervisor

Dr. Rajnish Garg
Professor & Head
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Co-Supervisor

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HEAD OF DEPARTMENT

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Place: _____

Date: _____

APPROVAL PROFORMA
BY RESEARCH & ETHICAL COMMITTEE
DAYANAND MEDICAL COLLEGE & HOSPITAL, LUDHIANA

Name of candidate	DR. Manvinder Singh
Department	ORTHOPEDICS
Topic of Thesis	COMPARATIVE ANALYSIS OF FUNCTIONAL OUTCOME IN PATIENTS WHO UNDERGO TOTAL KNEE ARTHROPLASTY WITH OR WITHOUT PATELLAR RESURFACING
Likely date of appearing in PG examination	MAY 2022
Date of enrollment	MAY 1, 2019
Name of Head of Department	DR. RAJNISH GARG
1) **Supervisor** 2) **Co-Supervisor**	1) Dr. Rajnish Garg 2) Dr. Pankaj Mahindra
Signature of Members of Research Committee with Stamp	**Signature of Members of Ethics Committee with Stamp**
Dr. Jaspal Singh (Professor & Head, Surgery)	Mr. A K Jindal (Member, Ethics Committee)
Dr. Dinesh Gupta (Professor & Head, Medicine)	Dr. Anu Sharma (Professor, Anatomy)
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Dr. Gurpreet S Wander (Vice Principal)	Dr. Gurpreet S Wander (Vice Principal)
	Dr. Gagandeep Singh (Secretary, Ethics Committee Professor & Head, Neurology)

Approved: Yes / ~~No~~

Dr. Sandeep Puri
Chairperson
Research Committee

Chairperson
Research Committee

Approved: Yes / ~~No~~

Prof. Arvind Malhotra
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Ethics Committee

Chairperson
Ethics Committee

BABA FARID UNIVERSITY OF HEALTH SCIENCES, FARIDKOT

PROFORMA FOR REGISTRATION OF SUBJECT FOR DISSERTATION

1	NAME OF THE CANDIDATE AND ADDRESS	Dr. MANVINDER SINGH G.S. MEMORIAL PREM HOSPITAL CANAL REST HOUSE ROAD OPP. BHUPINDRA KHALSA SR. SEC. SCHOOL (BOYS) MOGA, PUNJAB.
2	NAME OF THE INSTITUTE	DAYANAND MEDICAL COLLEGE AND HOSPITAL, LUDHIANA, PUNJAB
3	COURSE OF STUDY AND SUBJECT	ORTHOPAEDICS
4	DATE OF ADMISSION OF COURSE	01 MAY 2019
5	TITLE OF THE TOPIC	COMPARATIVE ANALYSIS OF FUNCTIONAL OUTCOME IN PATIENTS WHO UNDERGO TOTAL KNEE ARTHROPLASTY WITH OR WITHOUT PATELLAR RESURFACING.

6. BRIEF RESUME OF THE INTENDED WORK

6.1 NEED FOR THE STUDY

Osteoarthritis of the knee is a relatively common condition that affects approximately 10% of the general population above the age of 55 years.[1] TKA is a reliable procedure used to correct severe knee deformities, relieve pain and improve knee function usually following arthritis when conservative management fails. Despite the excellent record for TKA in the treatment of Knee Osteoarthritis, some patients show poor functional results and persistent anterior knee pain after TKA. This could be attributed to patellofemoral joint problems. Anterior knee pain is a common reason for patient dissatisfaction, reportedly seen in upto 5% to 47% of cases of post primary TKA.[2-4] To this cause, there are several modifications proposed which include patellar denervation, patellar resurfacing. Meanwhile, the optimal treatment for patellofemoral joint in primary TKA for knee Osteoarthritis remains undefined. Viewpoints regarding patellar resurfacing have evolved from no-resurfacing in early 1970s, to resurfacing in 1980s, and are currently moving towards selectively resurfacing based on clinical, radiological and intra articular findings.[5]

Advocates believe that resurfacing reduces complication rates and guarantees a predictable outcome with less anterior knee pain [6]. Whilst others believe that it contributes to post-resurfacing complications like patella fracture, patellar tendon injury, joint instability, failure of patella components, patellar clunk syndrome.[7] and increase operative cost and time with no overall benefit to patients.[8,9]

The most effective treatment of the patello-femoral joint during total knee arthroplasty (TKA) remains controversial, and according to different national arthroplasty registries there is a remarkable variation between countries in whether the patella is resurfaced or not. In Norway and Sweden, only 2% of the TKAs have their patellas resurfaced (Norwegian Arthroplasty Registry 2014, Swedish Knee Arthroplasty Registry 2014). In Denmark, 76% of the patellas are resurfaced (Danish Knee Arthroplasty Registry 2014) and in Australia

54% are resurfaced (Australian National Joint Registry 2013). In the USA, 98% of TKAs registered in the Kaiser Permanente Registry were performed with patellar resurfacing (Paxton et al. 2011). Advocates of patellar resurfacing emphasize cost-effectiveness, a reduced number of reoperations, and less anterior knee pain (Helmy et al. 2008, Clements et al. 2010, Murray et al. 2014). Proponents of patellar retention claim that patellar resurfacing offers no advantages in functional outcome, reoperation rate, or total healthcare cost (Burnett et al. 2009, Group et al. 2009, Breeman et al. 2011), and that it is associated with more complications (Ogon et al. 2002).

Due to different school of thoughts and results of studies done, it is necessary to properly review the literature, with a view to establish the strongest evidence available in support of the procedure.

So I want to conduct this study at Dayanand Medical College and Hospital, Ludhiana under guidance, to access the functional outcome in patients

6.2 REVIEW OF LITERATURE

Anatomy:

The patella is the largest sesamoid bone in the human body [10] , now known to improve quadriceps muscle leverage, to provide a low friction articulation with the distal femur, to help centralise the quadriceps mechanism over the trochlear groove and to prevent rapid wear of quadriceps tendon.[11]

The knee is the largest and most complex synovial joint and has a range of motion that involves rolling, gliding and rotating. The knee's anatomy creates an angle called the Q-angle (quadriceps-angle), which is along the line of pull of the quadriceps. It is measured clinically as the line from the anterior superior iliac spine through the centre of the patella and to the tibial tubercle.[12,13] This angle is valgus across the knee and this valgus force vector must be countered by the soft tissues restraining the patella and the lateral facet of the femoral trochlea.

The patella articulates with the cartilage in the patellar groove on the distal femur between 10 and 100 degrees of flexion with the groove following an arc of 90 degrees. The trochlea averages 31-34 millimetres (mm) in height, however there is considerable variation in trochlea height, width and shape within the population. The trochlear groove is between 35-38 mm wide.[14] The patella is a shifting fulcrum of the lever of the extensor mechanism as the knee constantly flexes and extends.[15] The amount of contact the patella has with the femur varies depending on the position of the knee. The patella contact area is small and distal in early flexion , and increases in area and progresses proximally throughout increasing flexion [16], maximum patella-femoral contact area occurs at 120 degrees of flexion.[17]

The contact pressure between the patella and femur is high with the maximum pressure occurring at 90 degrees in knees with a normal Q-angle.[17] This pressure can increase significantly where the Q-angle is increased, as in a valgus knee joint.

The patellar articulate cartilage is the thickest hyaline cartilage in the body, as is befitting of the huge forces transmitted through it. The thickest point is 7mm deep and the facets of the patella are unique in

shape and position to each individual knee.[18] Patellar cartilage is more permeable and more compressive than cartilage elsewhere [20], which may, along with large contact pressures, explain why patella cartilage lesions are more prevalent than other cartilaginous lesions.

Possible indicators for selective patellar resurfacing:

Little consensus exists regarding indication for patellar resurfacing. Current possible indicators include pre-operative anterior knee pain, patient obesity, high grade chondromalacia and patellar malalignment. Bourne et al [20] performed a study of American National Joint Replacement Registry data and formulated a clinical algorithm to help surgeons decide whether or not to resurface the patella during TKA.

(1) Resurfacing would be recommended if there is significant patella-femoral disease on history and examination.

(2) If on pre-operative assessment there appears to be mainly tibia-femoral disease, than an intra-operative patellar cartilage assessment should be made and if assessed as poor then resurfacing performed.

(3) If the patellar cartilage appears preserved then congruency and tracking are assessed with poor congruency and congruency requiring resurfacing.

(4) If the patellar tracks well and has a good congruency, then the arthritis aetiology is an important factor with patellar resurfacing considered for the inflammatory causes.

(5) Lastly, if the patient had non-inflammatory arthritis aetiology and is >60 years old , then resurfacing should still be considered.

Therefore, according to Bourne's algorithm, patellar resurfacing can be avoided in patients that are <60 years old with knee osteoarthritis, but without patella-femoral disease on history or examination and in tea-operative assessment shows preserved patellar cartilage on a well-articulating and centrally tracking patella.

Eirik Aunan et al stated in their study "Patellar resurfacing in total knee arthroplasty : Functional outcome differs with different outcome scores" A randomised, double-blind study of 129 knees in 115 patients (mean age 70(42-82) years; 67 females) with 3 years of follow up using KOOS as primary outcome measure showed that Patellar resurfacing maybe

beneficial over non resurfacing in patients undergoing primary TKA. Whereas using secondary, classical outcome measures — including KSS, OKS, and patient satisfaction recorded on VAS — did not reveal any statistically significant difference between groups.[21]

Sanjay Agarwala et al found in their study "Patellar resurfacing versus nonresurfacing with patellaplasty in total knee arthroplasty" a prospective study done on 120 knees (60 patients), using scores that include — mean KSS, MSMCS, Fellar patellar scores with Mean follow up of 19 months that there is no statistically significant difference in short term clinical, functional and radiological outcomes in the two groups operated by two different surgeons (including the possibility of surgeon based bias), and therefore routine resurfacing of patella in patients undergoing primary TKA with posterior stabilised Hi flex fixed bearing for knee Osteoarthritis is not advantageous.[22]

IH Abdulkareem et al studied in "patella resurfacing in total knee arthroplasty: A review of current literature" that it may be more sensible to selectively resurface the patella based on objective assessment of pre operative symptoms, radiographic images, intra articulate findings etc.[23]

Chengzhi Ha et al in their study of "Resurfacing versus not-resurfacing the patella in one-staged bilateral total knee arthroplasty: a prospective randomised clinical trial" analysing 120 knees stated that Anterior knee pain and clunk syndrome rates were lower on resurfaced side compared with the non-resurfaced side.[24]

Longo UG et al did a Systematic Review and Meta-Analysis for Patellar Resurfacing in Total Knee Arthroplasty with a comprehensive search of PubMed, MEDLINE, Cochrane, CINAHL and EMBRASE databases and found that The most important finding of this systematic review and meta- analysis is that the patellar resurfacing group had significantly better KSS pain (P 1⁄4 .0004) and postoperative HSS scores (P < .00001) compared to the non-resurfacing group. Additionally, the patellar-resurfacing group showed a lower reoperation rate (P < .00001) and postoperative anterior knee pain (P < .00001) compared to non-resurfaced TKAs. Therefore, based on these endpoints alone, patellar

resurfaced TKAs were demonstrated to have performed better overall.[25]

Lokesh Chawla et al in his study about Functional outcome of patellar resurfacing vs non resurfacing in Total Knee Arthroplasty in elderly : A prospective 5 years follow-up study compared a total of 100 subjects at department of orthopaedic surgery, Goa Medical College and Hospital and concluded that 82% of patients in patellar resurfacing group had shown excellent outcome as compared to 86% in non resurfacing group. Additionally, VAS revealed no significant difference between groups.[26]

Seong Hwan Kim et al in their study "comparasion of patellar resurfacing versus preservation in high flexion total knee arthroplasty" which was a retrospective matched-pairs case-control, clinical study of patients who had TKA's between 2001 and 2005 with a minimum follow-up of 7 years concluded that patellar resurfacing had advantages to improve clinical outcomes in terms of anterior knee pain scores related to high flexion activity, HSS and KS knee scores and stated that selective patellar resurfacing in high flexion TKA should be considered to improve clinical outcomes.[27]

Abdul khan et al in their study "Results of Total knee replacement with/without resurfacing of the patella" studied 688 patients, among which 449 had patellar resurfacing while 239 did not have resurfacing and 36 patients in the non resurfacing group had patelloplasty. In patients with pre-op patella-femoral pain, the incidence of post operative clunk was significantly higher ($p<0.005$) in the resurfacing group. In patients without pre-op patella-femoral pain, the incidence of post-op crepitus was significantly higher ($p<0.005$) in resurfacing group.[28]

Brian A. Spencer et al in their retrospective study of patellar resurfacing versus circumferential denervation of the patella in total knee arthroplasty compared rates of anterior knee pain and functional outcomes between resurfaced patellas and non resurfaced patellas with a circumferential denervation in a group of 169 TKA's (110 patients) with a minimum follow up of 2 years after total knee arthroplasty. There was no significant differences between the 2 groups regarding knee

society scores, anterior knee pain scores, or visual analogue scale scores. Circumferential denervation and patellar resurfacing during total knee arthroplasty lead to similar incidences of anterior knee pain.[29]

Donald W. Roberts et al did a research on patients of 2 surgeons at one centre enrolled in a prospective, blinded, randomised study of selective patellar resurfacing named "selective patellar resurfacing in total knee arthroplasty: A Prospective, Randomised, Double-Blind study" in which 350 knees in 270 patients were included in the study. Satisfaction was higher in patients with a resurfaced patella, But after long term follow-up of 10 years, there was no significant difference between 2 groups. No difference was found in KSS scores or survivorship. No complications of patellar resurfacing were identified. Overall concluded that patient satisfaction maybe slightly higher with patellar resurfacing. [30]

John D. Swan et al in their study of "The need for patellar resurfacing in total knee arthroplasty: A literature review" concluded that there is no single superior patellar treatment option available to an orthopaedic surgeon performing a total knee arthroplasty and the potential risks and benefits need to be assessed and balanced on a surgeon's experience, preference and patients expectations. Based on evidence to date, it appears that patellar resurfacing is the better option over non resurfaced patella. As can be seen from the literature over the decades, surgeons are improving patellar resurfacing outcomes through superior implant designs and fixation, better surgical technique and more anatomical extensor mechanism alignment. Selective patellar resurfacing appears to be the ideal solution if the selection could be based on robust criteria with a sound evidence base.[31]

D. G. Campbell et al did a randomised control trial, prospective double blinded study on "Patellar resurfacing in total knee replacement" using American Knee Society Score, WOMAC Score and radiographic evaluation and concluded that they were unable to recommend routine patellar resurfacing in osteoarthritic patients, undergoing total knee arthroplasty.[32]

6.3 AIMS AND OBJECTIVES

- To compare the functional outcome in patients who underwent TKR with patellar resurfacing or without patellar resurfacing.
- To compare frequency and severity of anterior knee pain and other complications in both groups (TKA with or without PR)

7.0 MATERIALS AND METHODS

7.1 SOURCE OF DATA

It is a prospective study evaluating the various factors affecting satisfaction of patients undergoing total knee arthroplasty from 1st Aug. 2019 to 31st Aug, 2021 (Including 6 month Followup) at the Department of Orthopaedics, Dayanand Medical College, Ludhiana. Patients will be assessed at a zero, one and six months follow-up period using a proforma having Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) Score.

7.2 METHOD OF COLLECTION OF DATA

A. Methodology and type of data collected:

After obtaining clearance and approval from the institutional ethical committee, patients will be enrolled on the basis of the inclusion / exclusion criteria after obtaining informed consent.

Detailed history will be obtained from patient record using study proforma.

INCLUSION CRITERIA-

- Patients undergoing primary TKR for knee arthritis.
- Patients willing to participate in the study.

EXCLUSION CRITERIA

1. Patients undergoing revision knee replacement.
2. Patients not willing to participate in the study

The study will be carried out by taking an informed consent from the patients willing to be a part of the study. Pre-op and Post-op pro forma (at minimum six months of follow up), and WOMAC score will be recorded to assess various factors which affect patient satisfaction.

Duration of study: This study will be from 1st Aug. 2019 to 31st Aug, 2021 (Including 6 month Followup) at the Department of Orthopaedics, Dayanand Medical College, Ludhiana

Place of study: Inpatients in Department of Orthopedics in teaching hospital attached to Dayanand Medical College & Hospital, Ludhiana.

Outcome: Functional Outcome at 6 month followup using WOMAC Score.

Statistical analysis: Data will be described in terms of range; mean ±standard deviation (± SD), frequencies (number of cases) and relative frequencies (percentages) as appropriate. For comparing categorical data, Chi square ($\chi 2$) test will be performed and exact test was used when the expected frequency is less than 5.A probability value (p value)less than 0.05 will be considered statistically significant. All statistical calculations will be done using SPSS (Statistical Package for the Social Science) SPSS 21 version statistical program for Microsoft Windows..

7.3 DOES THE STUDY REQUIRE ANY INVESTIGATIONS OR INTERVENTIONS TO BE CONDUCTED ON PATIENTS OR OTHER HUMANS OR ANIMALS? IF SO, PLEASE DESCRIBE BRIEFLY.

- Routine Investigations
- X Rays (Anteroposterior and Lateral Views) and other Radiological investigations if required.

7.4 HAS ETHICAL CLEARANCE BEEN OBTAINED FROM YOUR INSTITUTION IN CASE OF 7.3?

Attached Herewith.

LIST OF REFERENCES

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DAYANAND MEDICAL COLLEGE & HOSPITAL, LUDHIANA

Pro forma for Patients of Total Knee Replacement – Pre op

S.No. Date:

Name: Age:

Sex:

MRD No.: Admission no.

Diagnosis: OA / RA / Others

Side of proposed TKA: Right/ Left/ Bilateral

- Duration of complaints: > 10 y/ 5 – 10 y/ 2 – 5 y / 1 – 2 y/ ≤1 years prior to TKA/ Not sure

Parameter	Right (degrees)	Left (degrees)
Range of motion		
Alignment: Varus Valgus		
Flexion contracture		
Extension Lag		

- X-Rays Findings: Grade: (Kellgren and Lawrence classification of Osteoarthritis)

Signature of the Supervisor

Signature of the Candidate

PROFORMA

S no.:

Name: Sex:

MRD No.: Admission no.:

Date of Admission: Date of Discharge:

Duration of symptoms:

Diagnosis: Date of Surgery:

Unilateral /Bilateral:

Range of motion:

Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC):

Date:

The activities in each category to be rated from 0 to 4 according to increasing scale of difficulty

Stiffness

The following questions concern the amount of joint stiffness patient has experienced during the **last week** in knee. Stiffness is a sensation of restriction or slowness in the ease with which one moves one's knee joint.

S1. How severe is your knee joint stiffness after first wakening in the morning?

None	Mild	Moderate	Severe	Extreme
O	O	O	O	O

S2. How severe is your knee stiffness after sitting, lying or resting **later in the day?**

None	Mild	Moderate	Severe	Extreme
O	O	O	O	O

Signature of the Supervisor

Signature of the Candidate

Pain

P1. Walking on flat surface

None	Mild	Moderate	Severe	Extreme
O	O	O	O	O

P2. Going up or down stairs

None	Mild	Moderate	Severe	Extreme
O	O	O	O	O

P3. At night while in bed

None	Mild	Moderate	Severe	Extreme
O	O	O	O	O

P4. At rest

None	Mild	Moderate	Severe	Extreme
O	O	O	O	O

P5. Weight bearing

None	Mild	Moderate	Severe	Extreme
O	O	O	O	O

Function, daily living

The following questions concern patient's physical function. By this we mean patient's ability to move around and to look after their own. For each of the following activities patient has to indicate the degree of difficulty experienced in the **last week** due to his/her knee.

A1. Descending stairs

None	Mild	Moderate	Severe	Extreme
O	O	O	O	O

A2. Ascending stairs

None	Mild	Moderate	Severe	Extreme
O	O	O	O	O

Signature of the Supervisor

Signature of the Candidate

For each of the following activities please indicate the degree of difficulty patient has experienced in the **last week** due to his/her knee.

A3. Rising from sitting

None	Mild	Moderate	Severe	Extreme
O	O	O	O	O

A4. Standing

None	Mild	Moderate	Severe	Extreme
O	O	O	O	O

A5. Bending to floor/pick up an object

None	Mild	Moderate	Severe	Extreme
O	O	O	O	O

A6. Walking on flat surface

None	Mild	Moderate	Severe	Extreme
O	O	O	O	O

A7. Getting in/out of car

None	Mild	Moderate	Severe	Extreme
O	O	O	O	O

A8. Going shopping

None	Mild	Moderate	Severe	Extreme
O	O	O	O	O

A9. Putting on socks/stockings

None	Mild	Moderate	Severe	Extreme
O	O	O	O	O

Signature of the Supervisor

Signature of the Candidate

A10. Rising from bed

None	Mild	Moderate	Severe	Extreme
O	O	O	O	O

A11. Taking off socks/stockings

None	Mild	Moderate	Severe	Extreme
O	O	O	O	O

A12. Lying in bed (turning over, maintaining knee position)

None	Mild	Moderate	Severe	Extreme
O	O	O	O	O

A13. Getting in/out of bath

None	Mild	Moderate	Severe	Extreme
O	O	O	O	O

A14. Sitting

None	Mild	Moderate	Severe	Extreme
O	O	O	O	O

A15. Getting on/off toilet

None	Mild	Moderate	Severe	Extreme
O	O	O	O	O

For each of the following activities please indicate the degree of difficulty patient has experienced in the **last week** due to his/her knee.

A16. Heavy domestic duties (moving heavy boxes, scrubbing floors, etc.)

Signature of the Supervisor

Signature of the Candidate

None	Mild	Moderate	Severe	Extreme
O	O	O	O	O

A17. Light domestic duties (cooking, dusting, etc.)

None	Mild	Moderate	Severe	Extreme
O	O	O	O	O

Total Score: _____ (out of 96)

_____ Signature of the Supervisor

_____ Signature of the Candidate

INFORMED PATIENT CONSENT

Date: _____

I.....D/o, W/o, S/o..... am willing to participate in the study **"COMPARATIVE ANALYSIS OF FUNCTIONAL OUTCOME IN PATIENTS WHO UNDERGO TOTAL KNEE ARTHROPLASTY WITH OR WITHOUT PATELLAR RESURFACING."** The procedure with its complications has been explained to me in local vernacular language. I have fully understood that no special tests and extra expenditure in any form, merely for the purpose of thesis is being carried out. I am free to opt out the study any time without assigning any reason.

.....	.....
Signature of the Witness	Signature of the patient
Name:	

Signature of Candidate **Signature of Supervisor**

मरीज अनुमति फार्म

तिथि _____

मैं _____ पत्नी/पुत्र/पुत्री _____

निवासी

_____ इस

शोधकार्य **"COMPARATIVE ANALYSIS OF FUNCTIONAL OUTCOME IN PATIENTS WHO UNDERGO TOTAL KNEE ARTHROPLASTY WITH OR WITHOUT PATELLAR RESURFACING."** में भाग लेने के लिए सहमत हूँ। मैं इस शोधकार्य में भाग लेने के लिए अपनी स्वेच्छा से तैयार हूँ। मैं पुष्टि करता/करती हूँ की यह स्वीकृति देने के लिए मुझे कोई आर्थिक प्रलोभन नहीं दिया गया और न ही दबाव डाला गया है। मुझे इस शोधकार्य का उद्देश्य स्पष्ट कर दिया गया है और मुझे यह विश्वास है की यह विज्ञान और मानवता के लाभ के लिए है। मुझे इस शोधकार्य में होने वाले जोखिम के बारे में समझा दिया गया है और मेरी समझ में यह जोखिम बहुत मामुली है।

मैं इस शोधकार्य में भाग लेने के सम्बन्ध में किसी भी समय अपनी अस्वीकृति व्यक्त कर सकता/सकती हूँ और मेरे अस्वीकृति व्यक्त करने का मेरे इलाज पर कोई प्रभाव नहीं पड़ेगा।

_____ _____

गवाह के हस्ताक्षर रोगी के हस्ताक्षर/अंगूठे का निशान

नाम: नाम:

_____

अन्वेषक के हस्ताक्षर

_____

विद्यार्थी के हस्ताक्षर

ਮਰੀਜ਼ ਰਜ਼ਾਮੰਦੀ ਫਾਰਮ

ਮਿਤੀ_____

ਮੈ_____ਪਤਨੀ/ਪੁੱਤਰ/ਪੁੱਤਰੀ_____

ਵਾਸੀ _____

"COMPARATIVE ANALYSIS OF FUNCTIONAL OUTCOME IN PATIENTS WHO UNDERGO TOTAL KNEE ARTHROPLASTY WITH OR WITHOUT PATELLAR RESURFACING." ਤੇ ਚਲ ਰਹੀ ਖੋਜ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਰਜ਼ਾਮੰਦ ਹਾਂ। ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਲਈ ਮੈ ਆਪਣੀ ਮਰਜ਼ੀ ਨਾਲ ਤਿਆਰ ਹਾਂ। ਮੈ ਇਹ ਦਸਣਾ ਚਾਹੁੰਦਾ ਹਾਂ/ ਚਾਹੁੰਦੀ ਹਾਂ ਕੇ ਇਹ ਰਜ਼ਾਮੰਦੀ ਦੇਣ ਵਾਸਤੇ ਮੈਨੂ ਕਿਸੇ ਵੀ ਤਰਾਂ ਦਾ ਲੋਭ-ਲਾਲਚ ਨਹੀ ਦਿੱਤਾ ਗਿਆ ਅਤੇ ਨਾ ਹੀ ਕੋਈ ਦਬਾ ਪਾਇਆ ਗਿਆ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਦਾ ਮਨੋਰਥ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਭਰੋਸਾ ਦਵਾਇਆ ਗਿਆ ਹੈ ਕੇ ਇਹ ਖੋਜ ਵਿਗਿਆਨ ਅਤੇ ਮਾਨਵਤਾ ਦੀ ਭਲਾਈ ਲਈ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਵਿਚ ਹੋਣ ਵਾਲੇ ਖਤਰੇ ਬਾਰੇ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ ਅਤੇ ਮੈਨੂ ਇਹ ਯਕੀਨ ਹੈ ਕੇ ਇਹ ਖਤਰਾ ਬਹੁਤ ਮਾਮੂਲੀ ਹੈ। ਮੈਨੂ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਦਾ ਢੰਗ – ਤਰੀਕਾ ਸਮਝਾ ਦਿੱਤਾ ਗਿਆ ਹੈ।

ਮੈ ਇਸ ਖੋਜ ਕੰਮ ਵਿਚ ਹਿੱਸਾ ਲੈਣ ਬਾਰੇ ਆਪਣੀ ਰਜ਼ਾਮੰਦੀ ਕਿਸੇ ਵੀ ਸਮੇ ਵਾਪਸ ਲੈ ਸਕਦਾ ਹਾਂ/ ਸਕਦੀ ਹਾਂ ਅਤੇ ਮੇਰੀ ਰਜ਼ਾਮੰਦੀ ਵਾਪਸ ਲੈਣ ਦਾ ਮੇਰੇ ਇਲਾਜ ਤੇ ਕੋਈ ਅਸਰ ਨਹੀ ਹੋਵੇਗਾ।

_____ _____

ਗਵਾਹ ਦੇ ਹਸਤਾਖਰ ਮਰੀਜ਼ ਦੇ ਹਸਤਾਖਰ

ਮਿਤੀ_____ ਮਿਤੀ_____

ਪਤਾ _____ ਪਤਾ _____

_____

ਨਿਰੀਖਕ ਦੇ ਹਸਤਾਖਰ

_____

ਸਿਖਿਆਰਥੀ ਦੇ ਹਸਤਾਖਰ